Logistics Management Institute

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Volume 1: Results and Analysis

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Executive Summary

The Defense Business Operations Fund (DBOF) Corporate Board wishes to increase the capability of the accounting systems used in the Depot Maintenance Business Area (DMBA) of the DBOF. Also, they would like to decrease the number of accounting systems in the DMBA to increase standardization and decrease costs.

The DBOF Corporate Board wants an analytical basis to decide if it is preferable to reduce the number of accounting systems by moving to a separate system for each of the three Military Departments (Option One) or to move to a single system for all DoD DMBA activities (Option Two). These two options resulted from an apparent conflict: The logistics community pursued a *single* depot maintenance information system with both production and accounting capabilities at the same time the Defense Finance and Accounting Service (DFAS) was recommending *three* depot maintenance accounting systems — one for each Military Department. Therefore, the Under Secretary of Defense, Comptroller was concerned that significant investments could be made in the accounting systems for each Military Department, only to have a single system associated with the single production system replace them within a short period of time.

The Under Secretary of Defense, Comptroller directed that an economic analysis be performed so that the DBOF Corporate Board would have the cost information needed to make an informed decision on the preferable option.

The DFAS had already identified the candidate systems for Option One as the Standard Industrial Fund Accounting System (SIFS) for the Army, the Naval Air Systems Command Industrial Fund Management System (NIFMS) for the Navy, and the financial modules of the Depot Maintenance Management Information System (DMMIS financial subsystems) for the Air Force. Candidates for the single DoD system in Option Two were limited to those same three systems.

We conclude that Option One – a separate accounting system for each Military Department – is preferable to Option Two – a single accounting system for all DoD depots – at this time. This is because Option Two was predicated on a single set of production systems in all the depots. This

single set of production systems has not come about and is not currently planned. Instead, each Service has a unique set of production systems that feed into the financial systems. Consequently, multiple interfaces would have to be developed for any accounting system chosen as the single, standard system. That interface problem, combined with the unique business practices followed by each Service and the additional deployments Option Two would require, increase the investment costs of Option Two relative to Option One. Potential operating and support cost savings would be limited because two of the central design activities for the candidate systems would be retained for uses outside the DMBA. Increased investment costs and decreased operating and support cost savings make a single shared accounting system a poor choice at this time. If the depot production systems and business practices evolve toward a single system in the future, then the option of a single accounting system becomes more attractive.

To say Option One is preferable is not to say it is without cost. Estimating the cost of this option is essential to making decisions on the extent of system consolidation and its timing. We estimated the costs of upgrading the three systems to meet the functional requirements specified by DFAS and of deploying them to all maintenance depots in their respective Military departments.

The analysis of SIFS shows that for a one-time investment cost of $4.9 million, SIFS can be upgraded and deployed to the three Army arsenals. Operating and support costs will be unchanged. SIFS will improve the functionality of the existing arsenal systems and standardize DBOF accounting within the Army.

The analysis of NIFMS is more complex. Because NIFMS is being deployed first to the Navy R&D community, some costs will be paid during that deployment and will not have to be paid again by the DMBA community. The total one-time investment cost of upgrading NIFMS and deploying it to all Marine Corps and Navy maintenance depots ranges from $23.2 million (at the 50 percent confidence level) to $27.8 million (90 percent confidence level). Because some of this cost is shared with the R&D community, the *incremental* investment cost is $17.4 million to $19.9 million. The operating and support costs will increase for Marine Corps logistics bases, naval ordnance centers, and naval shipyards as a result of deploying NIFMS.

The investment costs of deploying NIFMS to the naval shipyards are substantial ($11.7 million to $13.9 million). This raises the question of whether it may be less costly to upgrade the existing financial management system at the shipyards, rather than replace it with NIFMS. Another option is to reengineer NIFMS to an open systems environment

configuration. This would significantly lower subsequent investment and operating and support costs.

The analysis of DMMIS has raised some very serious questions. The largest cost for DMMIS may be to make it work as advertised rather than to upgrade its functionality. DMMIS does not now accurately report costs of depot maintenance. Among the system's immediate deficiencies, there are serious errors in calculating variances (which, in DMMIS, results in incorrect reporting of so-called "actual" costs); in posting to the general ledger from the cost subsystem; and in proper identification of costs by organization. Coupled with a history of difficulty in making fixes without causing new problems, the cost of developing a working version of DMMIS' financial subsystems could be very high; also, it would take several years to complete.

In addition, the DMMIS financial subsystems alone will not provide coverage for all of an ALC's workload. In particular, engine workload and aircraft/other major end-item workload accounting for about 50 percent of the workload measured in dollars will not be covered. Most of the Air Force DMBA accounting systems would have to be retained to deal with those workloads. The retained systems would have to be fixed and validated. In addition, supplemental systems to augment the current systems would be required to meet DFAS requirements. All the costs for the retained and supplemental systems would have to be estimated to understand the true cost of using the DMMIS financial subsystems.

We have derived some estimates of the upgrade and deployment costs for the DMMIS financial subsystems. There is great uncertainty to those estimates because of the lack of good cost data and the fact that DMMIS is very much a developmental system. Deployment costs to date in Warner-Robins ALC have been substantial, yet the system is not yet running properly. Nonetheless, our estimates are $5 million to $15 million for upgrading DMMIS to DFAS standards, about $3 million ($1.5 million remaining) for deploying DMMIS to Warner-Robins ALC and Oklahoma City ALC, and $2 million to $3 million for developing and deploying supplemental systems to cover all ALC workload. This does not include the cost of fixing the DMMIS financial subsystems so that they work properly or the cost of fixing and validating retained systems. These latter costs may well be substantial and represent a significant element of risk.

In summary, the Army is already deploying SIFS to the arsenals; the costs of doing so are understood. The Navy is beginning to deploy NIFMS first to the Marine Corps logistics bases, then to the naval ordnance centers, and finally to the naval shipyards. The cost of deploying NIFMS can be estimated and may be high enough in the case of the naval shipyards to rethink moving NIFMS in its present form to the shipyards. Finally, the

Air Force, DFAS, and the DBOF Corporate Board face a difficult decision with respect to the DMMIS financial subsystems. Despite the large amount of money that has been spent on them, the DMMIS financial subsystems do not work properly now; the costs of fixing them are unknown but probably are high; and even if upgraded and deployed at a cost of $8 million to $18 million, those subsystems still would not cover all the workload at the ALCs. The Air Force, DFAS, and the DBOF Corporate Board must decide whether to further develop, fix, upgrade, and deploy the DMMIS financial subsystems or look at other options. We recommend the latter course.

Contents

Preface

This report is presented in two volumes. Volume 1, *Results and Analysis,* is the main body of the report and contains the narrative material needed by most readers. Volume 2, *Appendices B–H* contains material for those readers who desire further details.

Chapter 1. Introduction

PURPOSE OF DMBA ACCOUNTING

The purpose of Depot Maintenance Business Area (DMBA) accounting is to provide the information needed to ascertain the financial status of the entities within the DMBA. Specifically, the financial information required to prepare the Defense Business Operations Fund (DBOF) financial reports, reports required by statute (e.g., the Chief Financial Officer's (CFO) Act and Federal Managers' Financial Integrity Act (FMFIA)), and other information needed by OSD and Service headquarters. This purpose can be thought of as the financial accounting requirements for a DMBA accounting system.

Additionally, DMBA accounting systems should provide the financial data needed to help managers run the depots. This management accounting information differs somewhat from the financial accounting information in level of detail and purpose. One aspect of this information is cost accounting information. Cost accounting information allows managers within a depot to determine how efficiently work is being performed and whether the depot is experiencing a profit or a loss on current operations. This information, in the form of product costs, may also be used to compare the costs of specific products produced by different depots. In this guise, those costs are used not just by specific depot managers, but also by their customers and other interested parties. A desire to make such cost comparisons more meaningful was the initial impetus for moving toward a single DMBA cost accounting system.

CURRENT SET OF ACCOUNTING SYSTEMS IN THE DMBA

Multiple accounting systems are being used in the DMBA: four in the Army, four in the Navy, and a large suite of systems in the Air Force. Although they are all called DMBA accounting systems, they differ greatly in their complexity, coverage, age, and sophistication. The Services each nominated one or more of their current systems for consideration by DFAS. The Army nominated SIFS; the Navy NIFMS, SYMIS, and NOMIS; the Marine Corps MCIF; and the Air Force DMMIS.

CORPORATE BOARD OBJECTIVES

Meeting Statutory Requirements

The DBOF Corporate Board is concerned that the DMBA accounting systems meet the statutory requirements of the CFO Act [1] and FMFIA. [2] The DFAS Functional Requirements Document was designed to capture those statutory requirements as well as other requirements that DFAS proposed, such as electronic interfaces. [3] The candidate systems each were evaluated against the DFAS functional requirements and the results documented in the graded functional requirements document for each system.

Deploying Standard Systems

The second objective of the board is to reduce the number of DMBA accounting systems and promote standardization. Standardization is thought to have several benefits. The first benefit is a reduction in the number of systems that have to be maintained and updated. Fewer systems should mean fewer central design activities and could mean lower operating and support costs. The second benefit is that greater uniformity in the financial data can be obtained. Greater uniformity should result in more consistent definition of the data allowing more useful comparisons between organizations. Under the current systems, there is a concern that costs reported under one system may not mean the same thing as costs reported under another system.

ONE SYSTEM PER MILITARY DEPARTMENT

DFAS's initial recommendation was that standardization should be pursued by choosing one DMBA accounting system for each Military Department. On the basis of the graded functional requirements document, DFAS chose SIFS for the Army, NIFMS for the Navy and Marine Corps, and DMMIS for the Air Force. [4] Choosing this option allegedly would eliminate three current systems in the Army, two in the Navy, one in the Marine Corps, and one set of many individual systems in the Air Force. (The systems eliminated are referred to as "legacy" systems. The systems chosen as the standard for each military Department are referred to as "interim migratory" systems.)

A SINGLE SYSTEM FOR ALL DOD DMBA

The Corporate Board also wanted to consider the option of moving to one system for all the DoD DMBA. This would eliminate two more of the current systems and, presumably, make cost comparisons more meaningful across Services. The particular impetus for this consideration was the contention that there would soon be one production system in use at all DoD maintenance depots. Having one production system would mean that interfaces between the one production system and the single financial system would only have to be designed once. In addition, even lower level costs and other production indicators could be compared. (This single system is referred to as the "migratory" system.)

This study resulted from the apparent conflict between the migratory strategy (a single DoD system) for depot maintenance production and the interim migratory strategy (one system per Military Department) for depot maintenance accounting. The Under Secretary of Defense, Comptroller (USD(C)) accepted the DFAS interim migratory accounting system recommendations, but was concerned that significant investments could be made in those accounting systems, only to have a migratory system replace them within a short period of time. The USD(C) directed an economic analysis be performed so that the DBOF Corporate Board would have the cost information to make an informed decision on which strategy is preferable. [5] The DoD oversight group for the study was chaired by a DFAS representative and included two representatives from each Military Department and a representative from JLSC. (See Appendix A for members.)

ORGANIZATION OF REPORT

In this report we first look at Option One—one depot maintenance accounting system for each Military Department. In Chapter 2, we look at the summary results and the structure of our analysis. Then we discuss the analysis of Option One for each of the Military Departments in Chapters 3, 4, and 5 without developing detailed cost estimates.

Our analysis of Option Two is presented in Chapter 6.

Appendices B-H appear in Volume 2 of this report.

All costs in this report are stated in FY95 dollars.

Chapter 2. Option One: Results and Structure of Analysis

RESULTS: SUMMARY OF COSTS

For the Army, Option One replaces three accounting systems used in Army arsenals with SIFS, the system used in the rest of the Army Depot Maintenance Business Area (DMBA) and a number of other Army activities. The existing accounting systems at the arsenals are relatively small systems with limited functionality. Their replacement with SIFS increases the accounting functionality for the arsenals.

We estimate the investment cost of this replacement to be $4.9 million. There is no significant change in recurring operating and support (O&S) costs.

For the Navy, Option One replaces the three accounting systems used in the Marine Corps depots, the Naval Ordnance Centers, and the Naval Shipyards with NIFMS the accounting system used in the Naval Aviation Depots. The Marine Corps and the NOCs will experience an increase in accounting functionality as a result of this replacement. The NSYs will not see such a dramatic increase.

We estimate the total investment costs of this actions to be from $23 million to nearly $28 million as shown in Table 2-1. Annual O&S costs will increase. As shown, some costs are shared with the Navy R&D business area. Those costs are brought about by the decision to deploy NIFMS to the Naval R&D establishment. That decision forces an "upgrade" to DFAS functionality to be made. It also forces investments to be made to support NIFMS replacing NOMIS in several of the R&D sites. NOMIS is also the accounting system in the NOCs. Once the fixed costs of developing interfaces and enhancing the system are made for those R&D sites, the costs to go to the NOCs is very limited. Although we have noted these shared costs, it is the incremental costs that are important in our analysis.

For the Air Force, the picture is more uncertain. The DMMIS financial subsystems were meant to replace the current Air Force suite of accounting systems. However, in its current state, deployment of DMMIS will only eliminate two systems and require the development of supplementary systems. As Table 2-2 shows, the investment costs we have estimated total $8.5 million to $19.5 million. In addition, there are significant unknown costs. We think that those unknown costs may overwhelm those we have estimated. There are also unknown (but likely increased) costs for recurring O&S.

Table 2-1.
NIFMS Costs

Categories	Investment costs in millions of dollars		
	Total	Shared with R&D	Incremental depot costs
DFAS Required Upgrades Baseline O&S $7.2 million/year	3.0-4.0	3.0-4.0	0
MCLBs O&S $0.4 million/year ($.3 million above current)	2.9-3.1	0	2.9-3.1
NOCs O&S $0.9 million/year ($.4 million/year above NOMIS client–server)	5.6-6.8	2.8-3.9	2.8-2.9
NSYs O&S $6.6 million/year ($4.8 million above SYMIS FA/FV/FR client-server)	11.7-13.9	0	11.7-13.9
Total	23.2-27.8	5.8-7.9	17.4-19.9

Table 2-2.
DMMIS Costs
($ millions)

Cost Category	Estimate
Investment	
Upgrade DMMIS-F	$5 - 15
Deploy DMMIS-F	$1.5
Develop supplemental systems	$2 - 3
Fix and validate retained legacy systems	Unknown
Fix DMMIS	Unknown
Annual Operations & Support	
System Maintenance	
DMMIS-F	$2
Supplemental systems	$0.4
Retained legacy systems	Unchanged
Accounting	Unchanged
Computer Support	Unknown (but higher)

Our analysis of Option Two indicated that it was not a desirable option at this stage in the development of depot maintenance production systems. The DBOF Corporate Board concurred in this conclusion and allowed us to dismiss the option of a single system for all DMBA early on without developing detailed cost estimates.

STRUCTURE: COST TAXONOMY

This section defines the cost terms used in the study. The cost estimates that Logistics Management Institute (LMI) prepared for the study are displayed and explained elsewhere in this report.

One-Time Investment Costs

One-time investment costs include the non-recurring expenses of deploying the three interim migratory accounting systems. Covered therein are the costs of system upgrades and enhancements, the costs of interfaces, and certain other expenses. The following sections define those categories of cost.

UPGRADING TO MEET DFAS FUNCTIONAL REQUIREMENTS

Instructions from DFAS to LMI regarding the study required cost estimates of upgrading SIFS, NIFMS, and DMMIS to meet certain functional requirements. DFAS specified the functional requirements and compiled them in documents called "declarative statements." [6] Those materials, in turn, are a subset of DFAS's "Graded Functional Requirements" documents. [4] The graded functional requirements document also includes ratings of the degree to which SIFS, NIFMS, and DMMIS meet DFAS requirements for functionality. Government employees, under DFAS guidance, prepared the ratings. The requirements in the declarative statements are complemented by additional requirements surfaced in unique "supplemental questions" from representatives of DoD's depot maintenance community and from representatives of the Joint Logistics Systems Center (JLSC). [7]

The DFAS functional requirements addressed in the study cover nine major areas: funds distribution, general ledger, fixed assets, cost accounting, accounts payable, accounts receivable, billing, inventory accountability, and general systems features. Collectively, the three interim migratory systems suffered deficiencies identified by DFAS in all nine categories, but all three systems did not suffer deficiencies in all nine categories. In addition, within similar categories, shortcomings of the three systems were disparate. Therefore, SIFS, NIFMS and DMMIS all required upgrades of varying degrees. The study's cost estimates of upgrades to meet functional requirements cover the correction of the individual deficiencies in each system, including deficiencies related to the items identified in the supplemental questions.

The term "upgrade," in the context of functional requirements, is used in this study to refer to system changes to meet the functional requirements in the declarative statements as amended per later agreement. Later agreements between the study oversight group and DFAS excluded certain of the requirements.

Instructions from DFAS to LMI specifically excluded from the study costing of upgrades to the legacy systems that would be affected by the new deployments of SIFS, NIFMS, and DMMIS.

We used the commercial Software Life-cycle Management (SLIM) model to estimate upgrade costs and, in some cases, the enhancement and interface costs described below. SLIM is described in Appendix G.

Business Practice Enhancements

DFAS directed that this study assumes that no changes would be made to the existing business practices at the Army, Navy, and Air Force sites to which SIFS, NIFMS, and DMMIS would be deployed. Accordingly, LMI identified several accounting tasks that relate to unique business practices at certain Navy sites and that cannot now be performed by NIFMS. The study includes estimates of the cost of changes to NIFMS to allow it to accomplish those accounting tasks. In this report, such changes are called "enhancements" to distinguish them from "upgrades."

LMI identified the needed enhancements primarily during its on-site visits for the study. SIFS and DMMIS did not require any enhancements. That is because the relevant business practices at the arsenals to which SIFS is being deployed are similar to the corresponding business practices at sites that currently use SIFS, and all the ALCs follow substantially the same business practices.

Interfaces to Other Systems

In order to deploy SIFS, NIFMS, and DMMIS to additional sites, the accounting systems will have to interact with other automated or manual systems at such sites. Such interactions, called interfaces, are with systems that provide data to, or receive data from, the accounting systems. For example, systems that control the production of goods and services at each site often provide vital data, such as time and attendance records, to the three accounting systems. Alternatively, systems that provide consolidated management information about DMBA activities to higher headquarters rely on the accounting systems of the depots to provide needed data.

Costs for interfaces include, where applicable, costs of changes to both interfacing systems as well as the cost of developing a link between the two.

Deployment Costs

One-time deployment costs include, where appropriate, the following items: program management, training, testing, data conversion, and technical support. These classes of cost may be further subcategorized into local costs, which are borne by the site to which one of the three accounting systems is being deployed and central design activity (CDA) costs that are borne by the relevant CDA.

Program management costs cover the costs of supervisory personnel at the deployment sites and at the CDAs that manage the deployment. Training costs include the costs of developing the training curriculum and teaching the courses, which are borne by the CDAs. Training costs also include the salaries and travel expenses of the trainees, which are borne by the sites. Some of those training costs, such as salaries of trainees, are opportunity costs that were included at the request of DFAS staff.

Costs labeled "testing" in the report are primarily for testing of interfaces by the CDAs. Other testing costs, which are borne by sites, are included with costs of technical support provided by the sites. Data conversion costs, which are borne by the CDAs, cover the expense of converting data that has been used and stored by the accounting systems being replaced into usable input for the new accounting systems. Technical support costs include building and installing interfaces as well as support for customers of the newly deployed accounting system. For instance, this includes the costs of helping the staff of a new deployment site to become proficient in the use of the system. That is treated as a one-time cost for services provided during a fixed period after the deployment.

Recurring Operating and Support Costs

Recurring O&S costs are annual, steady-state costs expected to be incurred at the time the relevant system reaches full operational capability (FOC). They include system maintenance costs, accounting costs, and computer support costs, all of which are described below. LMI did not estimate the annual, time-phased operating costs leading up to FOC.

System Maintenance Costs

This category includes the costs expended by CDAs to support the relevant accounting system. CDA support would encompass functions such as correcting problems with the software code that occur after deployment. The category includes cost increases that CDAs likely will incur to support unique business practices at the additional organizations. In addition, it includes offsetting savings that CDA's are expected to realize as legacy systems either are shelved or are used less then at present. Those savings constitute the benefits considered by this study.

ACCOUNTING COSTS

Accounting costs embody changes in DFAS or DFAS customer costs that are expected because of the planned new deployments of SIFS, NIFMS, and DMMIS. DFAS operates under DBOF; therefore, it charges its customers rates that are intended to recover its total costs for a specific period of time. However, the rates DFAS pays for the computer support services it receives for any given fiscal year usually are established before that fiscal year begins.

Because circumstances during a fiscal year rarely match planning assumptions made in earlier years, DFAS's actual billings (revenues) do not equal its actual costs. DoD procedures for handling the differences between actual revenues and costs for any given year for a DBOF activity vary depending on circumstances. These procedures can have significant effects on DFAS's future cost recovery rates. In addition, DFAS is undergoing internal changes, not directly related to demands for services by specific DFAS customers, that will affect future cost recovery rates. For example, DFAS is expecting a significant productivity gain from consolidating its accounting sites. Finally, LMI is not privy to all the factors that DFAS uses to calculate its future cost recovery rates. Consequently, although LMI has collected some information about the effect on DFAS's costs of additional deployments of the interim migratory accounting systems, LMI is not able to predict DFAS's future billing rates for the purposes of this study.

In addition, LMI expects that deployment of the three accounting systems will not affect the quantity of services that DFAS provides to the Army, the Navy, the Marine Corps, or the Air Force. Therefore, LMI projects no significant change in DFAS billings as a direct result of the proposed deployments.

COMPUTER SUPPORT COSTS

Computer support costs cover expenses of computer hardware, computer software (other than the costs of DMBA accounting systems), peripheral hardware and support systems including communications lines and gateways, and other miscellaneous expenses for providing computer services to the accounting systems addressed in this study.

SIFS, NIFMS, and DMMIS presently are mainframe accounting systems that are supported by the Defense Information Systems Agency (DISA). DISA, like DFAS, is under DBOF, and therefore, it uses billing rates that are intended to recover its costs. For the reasons given in the preceding discussion of DFAS billing rates, LMI did not estimate changes in DISA's billing rates that might result from deployment of SIFS, NIFMS, and DMMIS. Instead, LMI used DISA's rates for FY95 to calculate the change in billings for adjustments in computer services due to those deployments.

Many of the legacy systems addressed in this study do not receive computer support from DISA. Those systems operate from mainframes, mid-level computers, or personal computers that individual sites own. LMI obtained information on the costs of operating and maintaining these systems from the sites and organizations that use them.

STRUCTURE: ASSUMPTIONS

The key assumptions for this economic analysis were specified in the task order for the study and in subsequent determinations of the DoD oversight group for the study. The assumptions are captured in the concept of operations for each system. These concepts of operations are shown in Appendix B.

General Assumptions

The following are the general assumptions made in our study:

- The candidate financial systems were current systems. That is, they were fully operational and had completed development. (This assumption is particularly important in our analysis of DMMIS.)

- Costs to be considered were those needed to upgrade the systems to meet the DFAS functional requirements, supply any unique functions necessary to meet the specified site's unique business practices, provide automated interfaces to the relevant systems, and deploy to the specified sites. Deployment includes training data conversion and technical support. In short, the system would have to supply all the current capabilities at a site as well as the added functional capabilities specified.

- Legacy systems would be eliminated. All accounting functions would be provided by the chosen system.

- Time and attendance systems are considered as feeder systems, not as part of the financial systems, although they are essential to their operation.

Requirements-Related Assumptions

The following are requirements-related assumptions:

- The "grades" from the declarative statement of the DFAS graded functional requirement are valid. The deficiencies to be corrected are those receiving a grade of "F" in the graded functional requirements document. Those deficiencies would be corrected if they were improved enough to receive a passing grade.

- The study's oversight group and DFAS would specify any other requirements to be added or subtracted from those in the graded functional requirements document. (Certain adjustments were made to the requirements. These are specified in Appendix C.)

Benefits

The only benefits to be quantified were savings resulting from eliminating legacy systems. The benefits of increased financial accounting functionality and increased depot efficiency were to be noted but not quantified in dollar terms.

SUMMARY

Initially it was assumed that there would be two options — three accounting systems or one accounting system. When the latter option was eliminated, the "classic" economic analysis methodology was no longer applicable. Instead, we have compared costs of the existing baseline system and the Option One interim migratory system. Doing so results in investment costs and no net savings in recurring costs. Calculating 20-year discounted cash flows incorporating uncertain assumptions about eventual system replacements is not useful under these circumstances. Therefore, we have limited ourselves to more straightforward comparisons of initial investment costs and annual recurring operating and support costs.

Other Service-specific assumptions are noted in each of the next three chapters.

Chapter 3. Option One: Army

INTRODUCTION

DFAS recommended the Standard Industrial Fund Accounting System (SIFS) as the candidate accounting system for the Army's DMBA.

What Is SIFS?

SIFS is the Army's primary automated system for managing resources within the Depot Maintenance Business Area (DMBA). SIFS is primarily a mainframe application that is run in the Industrial Operations Command (IOC) DMBA environment. The programming language is COBOL and most routines are batch update. The system is highly integrated with the other systems of the Integrated Logistics System (ILGS), and most data is passed on-line with a single source of entry. Individual screen displays within SIFS allow for the on-line entry of all data currently passed through an existing interface. SIFS contains a "shadow database" of some 1,600 data elements that can be accessed through the DATACOM data query language. A report writer is available to allow selected portions of standard output to be displayed on screen and printed at the users convenience. Users also have access to the Headquarters Application System (HAS) through an S2K query language.

SIFS is a part of the Army's ILGS, formerly referred to as the Standard Depot System (SDS). The ILGS consists of four functional elements: maintenance, supply, installation support, and resources management — all of which are highly integrated. The basic systems within resources management are shown in Figure 3-1. They are SIFS and the Automated Time, Attendance and Production System (ATAAPS). The three major accounting modules of SIFS are the "cost accounting" module, the "general fund accounting" module, and the "financial inventory accounting" module. These modules function independently, but they share cost data and operate as a single data input system. Regardless of the source of input data, all files and modules within the ILGS that share the data are automatically updated. ATAAPS is the front-end data collection system for labor and production that feeds the accounting system (SIFS), and is critical to execution of the accounting function. Both the Automated Internal Operating Budget module and the Methods and Standards module (shaded in Figure 3-1) are included in SIFS, but are not part of the accounting function as addressed within this study. SIFS is modular in design, thereby making it relatively simple to deploy to other industrial activities. The modular design also allows deployment of specific SIFS modules where the total system is not required.

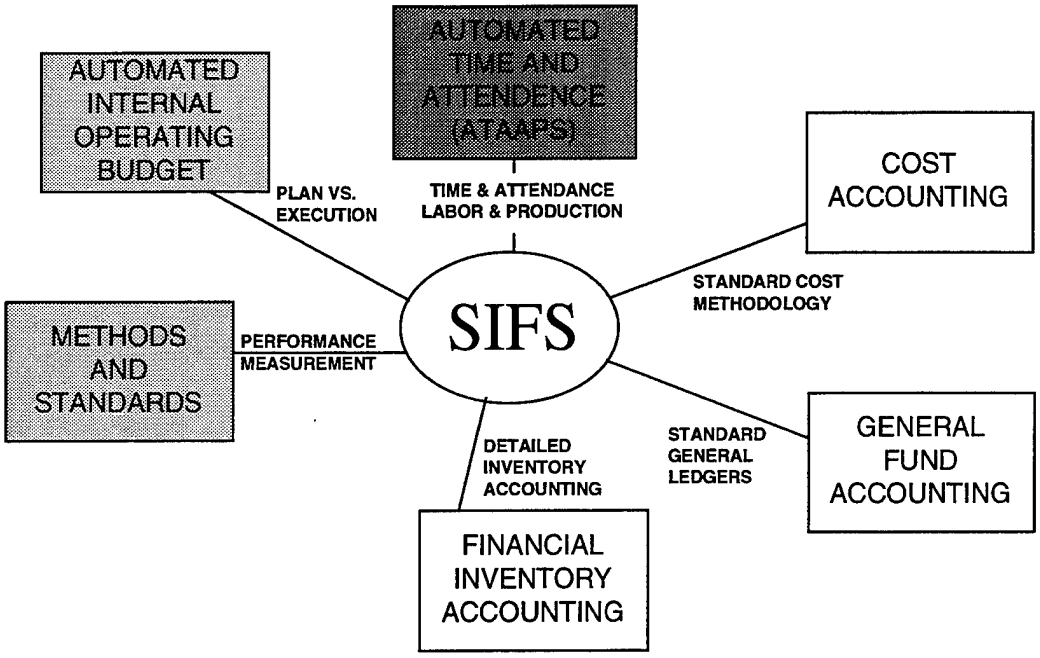

Figure 3-1.
SIFS Structure

Figure 3-2 shows the major accounting interfaces of SIFS with other functional areas within the DMBA. Automatic interfaces with the accounting system currently exist between all the functions shown except for disbursements and facilities project cost data, which require manual intervention.

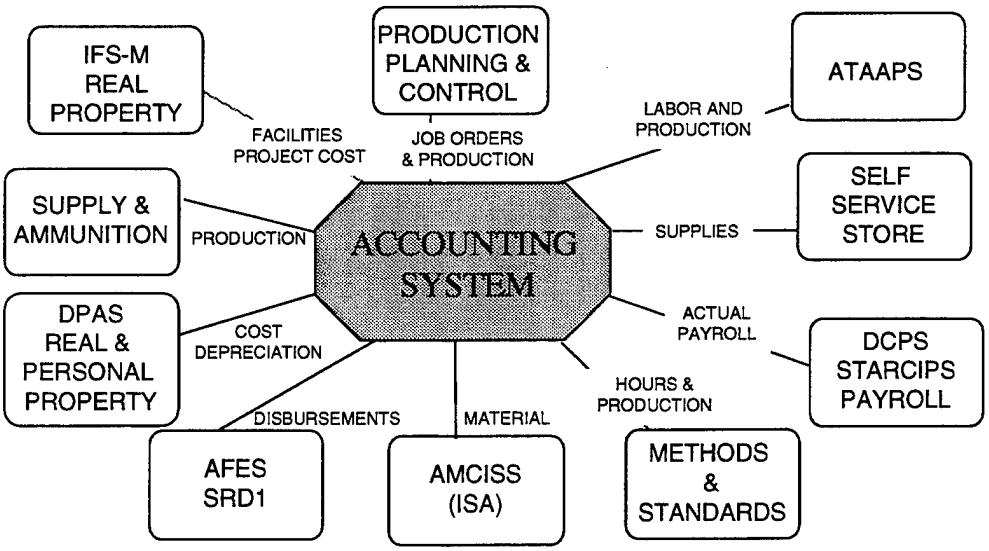

Figure 3-2.
Major Accounting Interfaces

SIFS in the Army Depots

The Army's industrial complex is organizationally assigned to IOC located at Rock Island, Ill. The industrial complex consists of the depots, arsenals, and ammunition plants as shown by Figure 3-3. The Industrial Logistics Systems Center (ILSC), formerly the Systems Integration Management Activity (SIMA)–East, located at Chambersburg, Pa., has the systems design and maintenance responsibility for all of the ILGS, including SIFS. ILSC is a fee-for-service organization. SIFS has been fully capitalized by the DFAS, and DFAS funds ILGS to maintain, upgrade, and modify it.

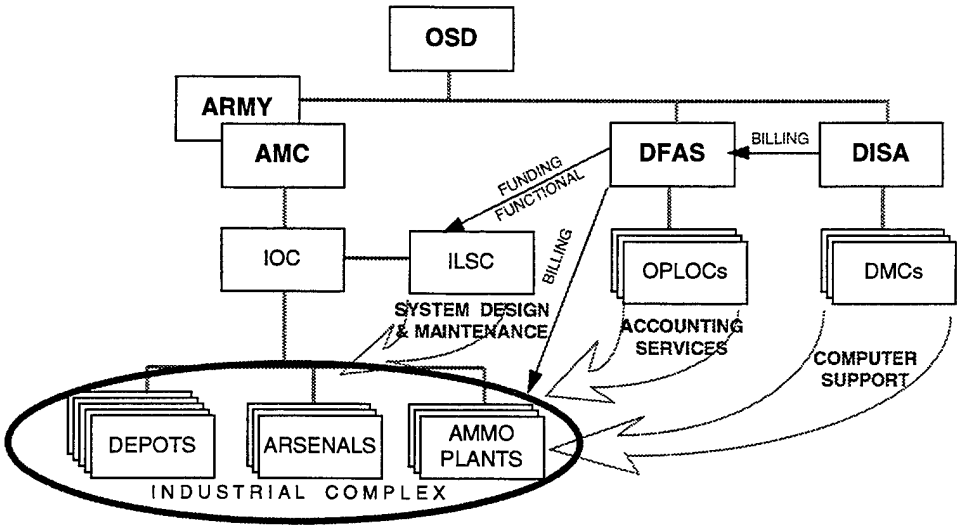

Figure 3-3.
Organizational Structure of Army Industrial Complex and Accounting Support

The DFAS accountants who actually perform the accounting services for the DBOF activities are located at Defense Accounting Offices (DAOs), which are normally colocated with the installation that they service, or at centralized locations called Operating Locations (OPLOCs), which service multiple DBOF locations from a central site. DFAS support is provided by DAO operations at Letterkenny, Tobyhanna, Anniston, and Red River; however, it is expected that over the next two to three years, all DBOF accounting operations for IOC depots and arsenals will be consolidated. The consolidated DFAS operation will be at the Rock Island, Ill. DFAS OPLOC. Computer support for accounting is provided by the Defense Information Systems Agency (DISA) Megacenters. Currently, those Megacenters operate IBM or IBM-compatible mainframes in Chambersburg, PA; Rock Island, IL; and Huntsville, AL. Scheduling support is provided by directors for information management at the following Army depots: Letterkenny, Tobyhanna, Tooele, Red River, Corpus Christi, and Anniston.

SIFS is operating at all army depots, ammunition plants, selected non-DBOF activities, and is being exported to the arsenals. Specific locations utilizing SIFS as their automated accounting system for DBOF activities are as follows:

- Anniston Army Depot
- Corpus Christi Army Depot
- Letterkenny Army Depot
- Red River Army Depot
- Sierra Army Depot
- Tobyhanna Army Depot
- Pueblo Depot Activity
- Savanna Depot Activity
- Umatilla Depot Activity
- Crane Army Ammunition Activity
- McAlester Army Ammunition Plant

In addition, SIFS supports the U.S. Army Security Assistance Center located at New Cumberland, Pa., and tenant activities located at the DBOF depots, even though these customers are Operation and Maintenance, Army (OMA) funded.

The system is being implemented at the Army arsenals between October 1995 and October 1996. Rock Island Arsenal was successfully implemented on 1 October 1995. Preliminary analysis has been conducted relative to the implementation of Pine Bluff Arsenal scheduled for March 1996.[1] Watervliet Arsenal is scheduled for implementation on October 1996. The concept of operations in Appendix B lays out the schedule for deployment of SIFS to the arsenals.

DFAS Objectives

DFAS has two objectives for the Army's accounting function. The first is to upgrade SIFS functionality to meet the DFAS functional requirements; and the second is to deploy SIFS to Army DMBA installations that are using other systems to accomplish their accounting functions.

During the evaluation of SIFS functionality conducted in August 1994, it was determined that SIFS lacked the functionality required to meet the functional requirements established by DFAS. Much of the shortfall was attributed to the lack of an automated interface in two critical areas: (1) the Automated Financial Entitlements System did not have an automatic interface with SIFS, and (2) although the Installation Equipment Management System (IEMS) does interface with SIFS, it does not automatically pass capital acquisition costs to the general ledger. A third factor that impacted the evaluation involved general

[1]After our analysis was completed, we were informed that the schedule for Pine Bluff may not be met. This could increase costs as well as effect the schedule. However, its cost effect will probably be relatively minor.

ledger accounts for budgetary capital authority. Although these accounts existed in the general ledger, there was no interface with the Integrated Modernization Management Information System (IMMIS), which contained details relative to capital projects. A total of 117 functional deficiencies were identified requiring correction in order to satisfy the DFAS functional requirements. The SIFS deficiencies are detailed at Appendix D of this report.

The only Army DMBA installations operating outside of the SIFS environment were the three arsenals: Rock Island, Pine Bluff and Watervliet. During the planning process to deploy SIFS to the arsenals, it was determined by DFAS that a prudent course of action would be to deploy the Army's ATAAPS to the arsenals for use as a front-end data collection system for SIFS. Interfaces between SIFS and ATAAPS already existed, eliminating the requirement to build additional interfaces and reducing the timeframe for deploying SIFS to the arsenals. The costs to deploy ATAAPS to the arsenals is approximately $100,000 per site; however, because ATAAPS is not part of the accounting system, these costs are not addressed in this analysis.

The Rock Island Arsenal conversion was funded in FY95 and both ATAAPS and SIFS have been successfully implemented. SIFS became operational on 1 October 1995 as scheduled. DFAS has funded ILSC for deployment of ATAAPS and SIFS to the remaining two arsenals, Pine Bluff and Watervliet, during FY96.

SIFS Deployment Schedule

Most of the Army's industrial base is operating under SIFS. The only DBOF funded installations that are not using SIFS as their automated accounting system are Pine Bluff and Watervliet Arsenals. With Rock Island Arsenal coming on line on 1 October 1995, the remaining two arsenals are scheduled to receive SIFS this fiscal year. Pine Bluff is scheduled to go on line with SIFS on 1 April 1996 and Watervliet is scheduled for 1 October 1996. ILSC has the lead responsibility for deploying SIFS to the two arsenals; the migration of SIFS to the arsenals is on schedule.

RESULTS AND STRUCTURE OF ANALYSIS

Summary of Costs

The summary of investment cost, by year, to upgrade SIFS to meet the DFAS functional requirements and to deploy SIFS to the three Army arsenals is displayed by fiscal year in Table 3-1. The figures shown for upgrading SIFS to the DFAS functional requirement represent both a 50% level of confidence and a 90% level of confidence.

Table 3-1.
Investment Costs to Upgrade and Deploy SIFS
($ millions)

	FY95	FY96	FY97	FY98	Total
Upgrade SIFS	–	0.0–0.1	1.0–1.3	0.5–0.7	1.5–2.1
Deploy SIFS to Arsenals	1.2	2.1	0.2	–	3.5
Total	1.2	2.0–2.1	1.2–0.5	0.5–0.7	4.9–5.5

Of the $3.4 million investment costs to deploy SIFS to the arsenals, an estimate of $300,000 per site is for training and file conversion costs that will be incurred by the arsenals. The remaining $2.5 million will be incurred by the system design activity (ILSC). Additional information concerning the ILSC cost elements is provided in Appendix D.

No significant changes are expected in recurring operating and support costs for financial systems as a result of upgrading SIFS to the DFAS functional requirements, or in deploying SIFS to the Army arsenals. The bottom line is that there will be no savings expected as a result of these actions for the following reasons:

- Current levels of system maintenance on the legacy financial systems at the arsenals require less than one manyear of effort to maintain; therefore, there will be no reduction in personnel at the arsenals.
- There will be no increase in staffing at ILSC to support the additional three arsenals. All system design, modification, and maintenance is either performed direct by ILSC within its organic resources or by contract personnel under the direction of ILSC. More than 90% of all system maintenance of SIFS is performed in-house.
- DISA has sufficient computer capacity to support the three additional Army sites, and they already provide computer support for the legacy systems. The level of computer support is not expected to change.
- DFAS accountants are performing the accounting functions under both systems, and the workload is not expected to change.

It is reasonable to assume there may be some future savings when system changes are required because the Army DBOF will be operating under one accounting system rather than the four that would remain in use if SIFS were not deployed to the arsenals.

Assumptions

A series of basic assumptions that impact schedule and costs were made during the course of the study. Acceptance of these assumptions are necessary to establish study parameters, but should not be considered as significant factors that would skew the results of the analysis. This analysis was conducted based on the following assumptions:

- The Army schedule for deploying SIFS to the arsenals is valid.
- ILSC personnel will be used to deploy SIFS to the arsenals.
- ILSC has sufficient personnel to support SIFS operation at the three arsenals.

ANALYSIS

Upgrade SIFS to DFAS Functional Requirements

A review of SIFS was conducted in August 1994, to assess compliance with DFAS functional requirements. [4] A key to determining compliance was the existence of an automated interface with feeder systems. A total of 117 functional deficiencies were identified in nine accounting categories. Nine of these deficiencies have been corrected or have a funded SCR in place to correct the deficiency, giving a baseline of 108 remaining deficiencies as shown in Table 3-2. ILSC personnel estimate that 253,000 lines of code will have to be written to correct the deficiencies. This estimate was based on technical estimates of skilled ILSC programmers who have been responsible for upgrading and maintaining SIFS since its inception in the late 1960s, and on historical data about the actual level of effort required to make changes to the system in the past.

Table 3-2.
SIFS Deficiencies by Category with ESLOC to Correct

Accounting Category	Functional deficiencies	Deficiencies corrected	Current deficiencies	Lines of code
Funds distribution	20	0	20	35,618
General ledger	3	0	3	8,687
Fixed assets	11	4	7	12,162
Cost	23	2	21	59,942
Payables	17	0	17	7,796
Receivables	29	2	27	47,780
Billing	11	0	11	32,143
Inventory accountabliity	0	0	0	–
General system features	3	1	2	47,892
TOTAL	117	9	108	252,020

The series of charts shown in Figure 3-4 reflect the historical data points of the ILSC database for three areas: level of effort, time to accomplish the programming, and the size of the team involved in the effort. The open squares on these charts represent historical data on the actual experience of ILSC with development of similar programs. The black squares reflect the Army's estimate of the resources required to upgrade SIFS to meet the DFAS requirements. The heavy line in the middle represents the average of similar software development efforts across industry and government. The two lighter lines paralleling the heavy line are one standard deviation from the average. The charts show that ILSC's experience reflects a close fit to the expected norm. This gives a good indication that the data points, and therefore, the estimates, are realistic.

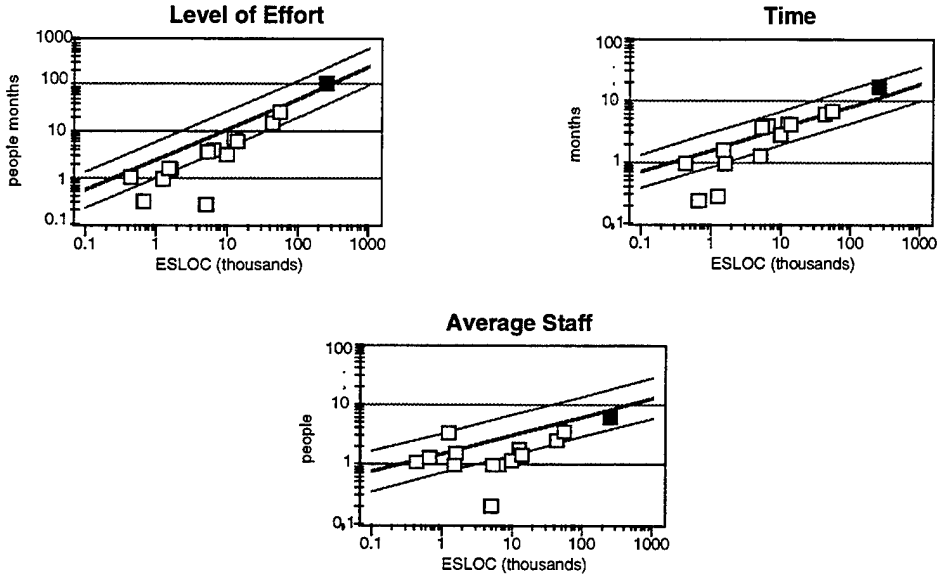

Figure 3-4.
SIFS Upgrade Estimates

As shown in the "average staff" graph, the ILSC uses small groups to perform required programming. Colocated with the programmers are functional analysts who work closely with the programmers on functional aspects throughout the process, and they jointly conduct system testing and evaluation. This integrated approach, coupled with the fact that the personnel working SIFS changes are the same people who developed SIFS over the years, has resulted in slightly better performance than the industry/government average.

SLIM was used to develop our cost estimate for the level of effort identified in Table 3-2. Based on the skill level and number of programmers available to perform the task, the model generated an estimate of $1.5 million and 24 months to accomplish the required SIFS upgrade. These estimates are at a 50 percent confidence level that both the cost and time frame are on target. This number tracks with the historical performance of the ILSC, and its estimate of $1.5 million and 21 months. The ILSC estimates, using SLIM at the 50 percent

confidence level, were $1.2 million and 21 months. Raising the confidence level to 90 percent will increase the cost estimate to $2.1 million for 21 months. Table 3-3 compares the Army estimate with the independent LMI estimate for upgrading SIFS.

Table 3-3.
SIFS Upgrade Cost Estimates Comparison

	50% Level		90% Level	
	$ millions	Months	$ millions	Months
Army estimate	1.2	21	2.1	26
LMI estimate	1.5	24	2.1	24

The estimates provided were based on valid estimating techniques; however, there are always some key factors where variances in the estimated value can have a significant impact on the outcome. The factor that this estimate is most sensitive to is the productivity index. The productivity index was developed on the basis of the availability of highly skilled programmers and functional personnel experienced in system design and maintenance of the Army's financial accounting system for depot maintenance. The ILSC has a well-trained, experienced staff of programmers and functional analysts who have worked SIFS programs and applications for a number of years. This is one of the factors that has resulted in a productivity index (PI) that is slightly higher than the industry average. Although historical data support the PI of 18.6 for this organization as indicated by the black square in Figure 3-5, it must be recognized that the integrity of this estimate is dependent on maintaining this relatively high level of productivity. The graphs in Figure 3-5 show that by varying the PI from 15.5 to 20.5, the estimate will vary significantly in relation to both cost and time. A drop in PI to 15.5 will result in an increase in the cost estimate from $1.5 million to $2.4 million and will extend the timeline for completion of the SIFS upgrade from 24 months to 37 months.

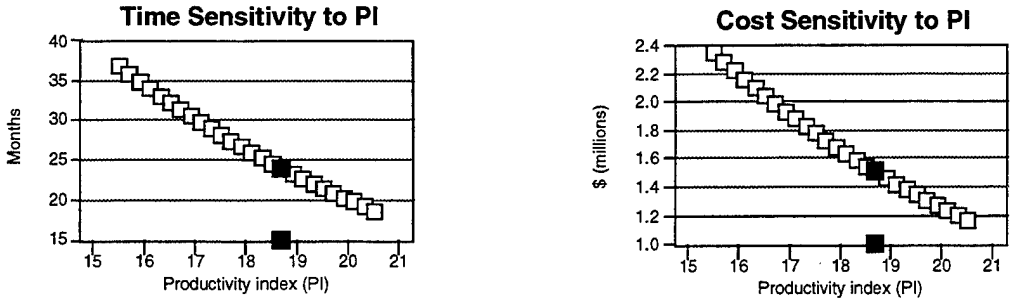

Figure 3-5.
Sensitivity of Productivity Index on SIFS Upgrades

The ILSC is a tenant activity on Letterkenny Army Depot in Chambersburg, Pa. The approved Base Realignment and Closure (BRAC) Commission report for FY95 directed that the depot maintenance mission at Letterkenny be closed and

tenant activities relocated to other installations. The Army plans to transfer the ILSC (mission and personnel) to Rock Island, IL to be colocated with its parent command, the IOC. Because of this decision and the projected FY97 move to Rock Island, it is possible that some of the skill base that currently exists could be eroded prior to completion of the enhancements to SIFS. Should the loss of key personnel become a reality, the productivity index will probably drop and the cost of the project will increase significantly.

SIFS Deployment to Arsenals

The Army had begun a DFAS funded initiative to deploy SIFS to all of the U.S. Army Arsenals within the US Army Industrial Operations Command prior to this study. The initial site, Rock Island Arsenal, was totally funded in FY95 and became operational on October 1, 1995 as scheduled. Figure 3-6 identifies the deployment schedule and the system design (ILSC) cost associated with deployment of SIFS.

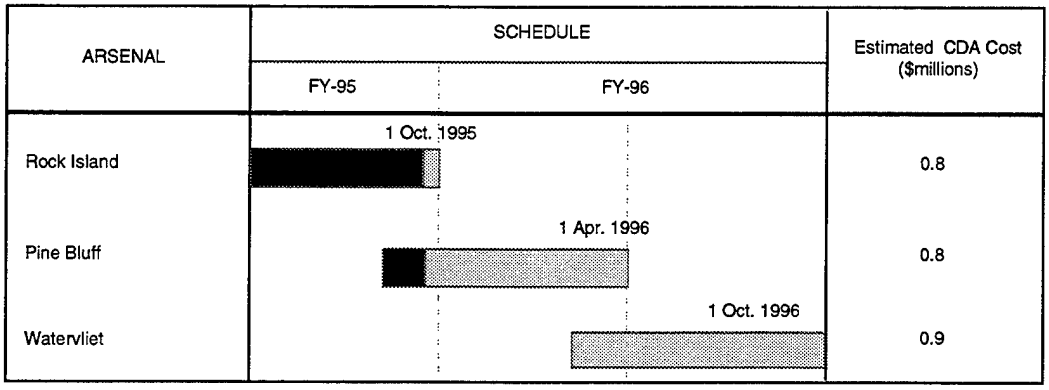

Figure 3-6.
SIFS Deployment Schedule to Army Arsenals

The majority of the investment costs associated with deployment of SIFS to the arsenals is borne by the central design agency, ILSC, and funded by DFAS. These costs are identified in Table 3-4 with additional details included in Appendix D-4.

Table 3-4.
Cost of SIFS Deployment to Army Arsenals
($ millions)

Category	Rock Island	Pine Bluff	WaterVliet	Total
Interfaces	0.1	0.1	0.1	0.3
Deployment				
CDA Costs	0.7	0.7	0.8	2.2
Site Costs	0.3	0.3	0.3	0.9
Total	1.1	1.1	1.2	3.4

Costs to deploy SIFS to the arsenals include ILSC costs as well as in-house costs incurred by the arsenals. The ILSC is responsible for building interfaces between SIFS and the legacy programs, providing file layouts for converting data to the SIFS format, testing the interfaces, training arsenal personnel and providing technical support during the conversion process. Total costs for deploying SIFS to the three arsenals is estimated to be $3.4 million.

As Table 3-4 shows, additional site costs of $300,000 will be incurred by each of the arsenals in developing interfaces, changing codes to match SIFS requirements, working with the ILSC programmers and functional analysts during implementation and testing, and training personnel. Training packages have been developed in three categories: (1) cost accounting, (2) general fund accounting, and (3) ATAAPS. The cost of trainees time and associated travel will make up about 20% of this cost, with ATAAPS training accounting for the majority of the training cost because every supervisor involved in time and attendance as well as labor and production reporting must be trained.

Total deployment costs of $3.4 million are shared between ILSC and the sites, as follows:

- ILSC—$2.5 million
- Site costs—$0.9 million.

SUMMARY

Costs

Efforts are well underway to deploy SIFS to the arsenals. As shown in Figure 3-7, by the end of FY95, $1.2 million had been expended to bring Rock Island Arsenal on line with SIFS, and to begin planning for deploying this suite to Pine Bluff Arsenal. $2.2 million will be required in FY96 to complete the migration to Pine Bluff and Watervliet Arsenals. An investment of two years and $1.5 million (at a 50% level of confidence) will be required to upgrade SIFS to meet the DFAS functionality. This investment of $4.9 million over a three-year period will allow DFAS to meet its objective of migrating SIFS to all Army DBOF sites and reduce the number of legacy accounting systems used within DoD.

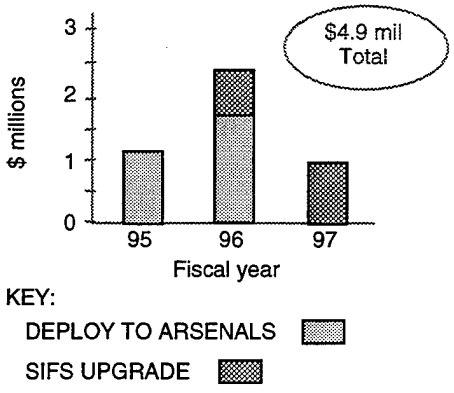

Figure 3-7.
Total Investment Costs

There will be little impact on recurring O&S costs. No change in computer support costs by DISA will occur because it will continue to provide computer support for the same number of DBOF sites utilizing existing computer capacity. DFAS cost will not change since they will continue to provide accounting support for the same number of DBOF sites. The ILSC's cost to maintain the three additional sites is not expected to change; however, there could be some downstream cost reductions resulting from less programming effort to effect mandated system changes if the Army is on a single financial accounting system. This reduction in effort could benefit the user sites directly since they will no longer be using their resources to program, test, and implement system changes.

Issues

One of the key factors that allows the Army, and specifically the central design activity for SIFS (ILSC), to be in a position to upgrade this system at a nominal cost and within a relatively short time frame, is the high level of expertise and continuity between its programmers and functional system analysts. With the impact created by the Base Realignment and Closure Commission (BRAC) recommendations, the ILSC is scheduled to relocate from Chambersburg, PA to Rock Island, Ill. in the summer of 1997. On the basis of experience gained by the Depot Systems Command (DESCOM) relocating to Rock Island to form the IOC over the past two years, there is ample evidence to conclude that the ILSC will lose skilled personnel and their high productivity level could be adversely impacted. This risk can be mitigated to the degree that the ILSC may be able to augment their staff through the use of retired annuitants or contractor personnel, but it is unlikely that they will be able to maintain the same productivity level that currently exists.

Conclusions

One of the objectives of DFAS is to have all DBOF installations use an accounting system that is in total compliance with requirements of the Federal Managers' Financial Integrity Act and the Chief Financial Officers' Act of 1990. Upgrade of SIFS at a cost of $1.5 million to $2.1 million will have the Army in total compliance within two years of upgrade initiation.

A second objective of DFAS is to reduce the number of different accounting systems within the DoD. By deploying SIFS to the arsenals, the number of accounting systems within DoD will be reduced by three and the number of time and attendance systems that feed data into the financial system will be reduced by three. The bottom line result will be that the Army's DBOF accounting will operate using a single accounting system by the end of FY96 with a total investment of approximately $4.9 million to $5.5 million (includes $0.9 million site cost). DISA already has sufficient computer capacity to accommodate these additional sites.

No significant impact on O&S costs will result from these initiatives. There is no requirement to increase the ILSC staff to provide system support to the arsenals. Their current staff is adequate to provide system maintenance support to all sites that use SIFS, including the addition of the arsenal sites. However, because we will be dealing with one accounting system within the Army DBOF, one may expect some downstream savings during system changes because only one system change will take place under SIFS while four changes would have been required under the status quo. No changes in costs associated with performing the accounting services or computer support are anticipated as a result of these initiatives.

Chapter 4. Option One: Navy

INTRODUCTION

DFAS recommended the Naval Air Systems Command (NAVAIR) Industrial Financial Management System (NIFMS) as the candidate financial system for the Department of the Navy's depot maintenance activities. Those activities are the Naval Aviation Depots (NADEPs), the Marine Corps Logistics Bases (MCLBs), the Naval Ordnance Centers (NOCs), and the Naval Shipyards (NSYs).

What Is NIFMS?

NIFMS is the financial part of the Naval Aviation Depot Information Management (NADIM) suite of systems. NIFMS supports the six NADEPs, three of which are scheduled to close under the base realignment and closure process. It contains about 2.6 million lines of COBOL code and runs on UNISYS mainframes at DISA's Jacksonville and San Diego megacenters. All accounting support for the NADEPs is provided by DFAS personnel at the Operating Location, San Diego. Depot and DFAS personnel use NIFMS.

NIFMS receives source data from a variety of other information systems, most notably the NADIM's Workload Control System and the NAVAIR Industrial Material Management System. It interacts with or produces output for a variety of other local and defense or Navy standard systems including the Defense Civilian Pay System, the Department of the Navy Industrial Budget Information System, Standard Accounting and Reporting System (STARS), and Industrial Fund Collection and Disbursing Reporting System (IFCDRS).

What Needs To Be Done?

During 1994, USD(C) directed DFAS to convene a team of DoD functional experts to evaluate the maintenance depot financial systems in use by the depots and nominated by the Services as candidates for a standard system for use by all depots. NIFMS was the highest scoring of the Navy systems [4] (and in fact, of all systems nominated) and was selected as the Navy alternative for either cross-Service or intra-Service standardization.

Although NIFMS was the highest scoring of the Navy systems, it did not provide all capabilities that DFAS desired in their financial systems. As a result, NIFMS must be upgraded to meet DFAS requirements.

Additionally, NIFMS must replace the financial systems in use at the other Navy and Marine Corps maintenance depots. The systems to be replaced are the Marine Corps Industrial Fund (MCIF) system at the MCLBs, the Naval Ordnance Management Information System (NOMIS) at the NOCs, and the financial portions of the Shipyard Management Information System (SYMIS financials) at the shipyards. Appendix B-2 provides the concept of operations for this deployment.

In general, to replace those systems with NIFMS, three sets of actions must take place:

- NIFMS must be enhanced to provide all functionality currently in the system to be replaced;
- NIFMS must receive data from, and provide data to, the suite of computer systems in use at the depots; and
- NIFMS must be deployed to the new sites.

We have used these three categories — enhancements, interfaces, and deployment — to identify the one-time investment required to deploy NIFMS to the Navy/Marine Corps maintenance depots.

Chapter Organization

In this chapter, we document our economic analysis of upgrading NIFMS to full DFAS functionality and deploying it to new sites. We first summarize our results, define the cost and savings elements, and document the assumptions made during the analysis. Then, we describe the baseline NIFMS system, including its operating and support costs and its costs to meet DFAS requirements.

In the following sections, we describe the baseline systems at the MCLBs, NOCs, and NSYs. Then, we outline the actions necessary and the estimated costs to deploy NIFMS in place of the existing financial systems at those installations. Next, we look at an excursion, requested by DFAS, that addresses how costs would change if an open-systems-environment (OSE) version of NIFMS were deployed instead of the mainframe version as currently planned. Finally, we summarize the results of the economic analysis and raise several issues that DFAS and the DBOF Corporate Board should address. Among these issues are the following:

- Are the current, aggressive deployment schedules and plans realistic?

- Will NIFMS be converted to an open systems environment, and if so, when?
- Is it cost-effective to deploy NIFMS to the shipyards?

Several other issues arose during the course of the study and have already been resolved. These include: assigning a Navy program manager; dropping of several unnecessary and costly requirements; and funding a change to NIFMS to allow more than one NIFMS database to reside on one central processing unit and its associated peripherals.

The appendices in Volume 2 of this report provide additional supporting information.

SUMMARY OF RESULTS AND STRUCTURE OF ANALYSIS

Summary of Results

INVESTMENT COSTS

Table 4-1 summarizes the one-time investment costs required to upgrade NIFMS to meet DFAS requirements and to deploy NIFMS to MCLBs, NOCs, and NSYs. Because DFAS has also approved NIFMS as the financial system for the R&D business area, some of the costs included in this study will be incurred regardless of any decision made in the depot maintenance arena. We have identified those costs in Table 4-1.

Table 4-1.
Required Investments
($ millions)

Activity	Total	Shared with R&D	Incremental depot maintenance costs
DFAS Upgrades and Baseline O&S	3.0–4.0	3.0–4.0	0
MCLBs	2.9–3.1	0	2.9–3.1
NOCs	5.6–6.8	2.8–3.9	2.8–2.9
NSYs	11.7–13.9	0	11.7–13.9
Total	23.2–27.8	5.8–7.9	17.4–19.9

Costs associated with system changes are given as ranges. The lower end of each range represents the most likely cost (50 percent probability). Actual costs are just as likely to exceed as to be less than this amount.

The upper end of the range provides a high confidence (90 percent probability) that actual costs will be less than or equal to this amount.

DISA investments are not billed directly to the using Service. Instead, the costs are charged to all users by reflecting the cost in DISA's billing rate. Therefore, they are excluded from this analysis.

DFAS upgrades will cost $3 million to $4 million. Those upgrades will provide the additional functionalities that DFAS requires. All of these costs will be incurred regardless of whether NIFMS is deployed further within the DMBA, because the functions are also required by the R&D community.

The MCLBs require an investment of $2.9 million to $3.1 million to interface with the existing suite of systems and deploy to Albany, Ga. and Barstow, Calif. None of these costs are shared with the R&D community. This deployment is of a high priority, because the existing MCLB financial systems were evaluated as having a very limited functionality. Initial deployment should occur early in FY97.

The NOCs require an incremental investment of $2.8 million to $2.9 million to deploy to NOC Atlantic (Yorktown, Va.) and NOC Pacific (Seal Beach, Calif.). These organizations can take advantage of $2.8 million to $3.9 million in required investments for the R&D business area for required business practice enhancements to NIFMS and interfaces to Naval Sea Systems Command (NAVSEA) standard systems. The total investment required is $5.6 million to $6.8 million.

The NSYs require an investment of $11.7 million to $13.9 million to provide unique business practice enhancements, interfaces to shipyard systems, and to deploy NIFMS to the four shipyards (Portsmouth, N.H.; Norfolk, Va.; Puget Sound, Wash.; and Pearl Harbor, Hawaii). None of these costs are shared with the R&D community.

Recurring Operating and Support Costs

Table 4-2 summarizes the annual recurring operating and support (O&S) costs for the Navy and Marine Corps maintenance depots for systems maintenance and computer operations. The first column is the estimated annual cost once NIFMS is deployed to each type of organization. The second column is projected, annual O&S at the time NIFMS would deploy. The third column is the net change and, in the case of all new deployments, shows that annual O&S costs will increase. A third category of costs, DFAS accounting costs, also was evaluated. No change in the cost of accounting support is anticipated due to NIFMS deployment.

Table 4-2.
Recurring Operating and Support Costs
($ millions)

Activity	Annual O&S after NIFMS	Annual O&S before NIFMS	Net change
Baseline O&S	7.2	7.2	0.0
MCLBs	0.4	0.1	0.3
NOCs	0.9	0.5	0.4
NSYs	6.6	1.8	4.8
Total	15.1	9.6	5.5

The estimated annual operating and support costs under NIFMS total $15.1 million. These costs include $7.2 million for baseline NIFMS (i.e., costs for DFAS services and NADEP activities); $400,000 for the MCLBs (an increase of $250,000 over the baseline); $900,000 for the NOCs (an increase of $400,000); and $6.6 million for the NSYs (an increase of $4.8 million). The baseline costs include all the fixed costs of the NIFMS CDA as well as those costs that support NADEP-unique business practices. The large increases for the NOCs and NSYs are caused by much higher O&S costs for DISA computer operations for mainframe NIFMS compared to the mid-tier, client-server systems that NIFMS will replace. CDA costs would drop for both the NOCs and NSYs. The Marine Corps increase reflects CDA support (there has been little in the past) and some increase in computer operations support costs to run the more sophisticated NIFMS (as compared to the existing financial system).

Schedule

DFAS has not determined a final schedule for deploying NIFMS throughout the Navy maintenance depots. For purposes of this study, LMI was directed to assume a rapid deployment with the following priorities:

- *Marine Corps logistics bases.* These sites have the most pressing need because their current financial systems lack many required capabilities.
- *Naval ordnance centers.* Deployment to these sites will be facilitated by NIFMS deployment to the R&D community, which uses many of the same feeder systems and requires many of the same enhancements as the NOCs.
- *Naval shipyards.*

These priorities, along with the anticipated duration of preparations (two years for DFAS upgrades, one year for the MCLBs, two years for the NOCs, and two to three years for the NSYs), led to the following schedule assumptions presented in the NIFMS concept of operations (see Figure 4-1 and Appendix B):

- *MCLBs.* Deployment to the sites will begin in FY97 and will be completed that year. Preparation is underway.
- *NOCs.* Deployment to the first NOC could occur mid-FY98 with the second site following six months later.
- *NSYs.* Deployment to the first shipyard could occur in early FY99 with the second site following six months later. Remaining shipyards will convert to NIFMS at the rate of one per quarter, with all sites converted by the end of FY00.

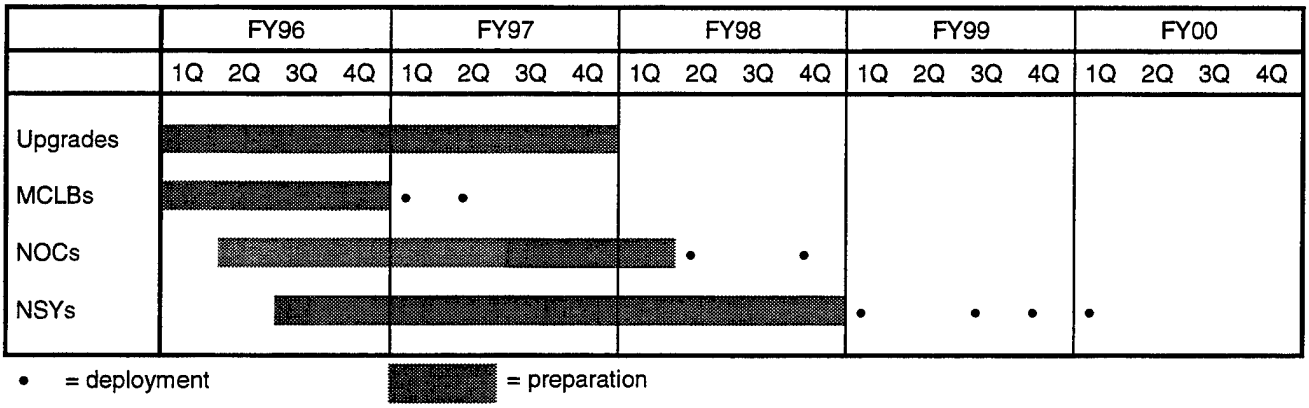

Figure 4-1.
NIFMS DMBA Deployment Schedule

Analysis Methods and Assumptions

Investment Costs

Analysis Methods

The NIFMS CDA has an extensive database on the cost and effort of past system maintenance and upgrades. Cost estimating at the CDA is accomplished by comparing new requirements with the cost of similar projects in the past. No formal cost estimating tool is used by the CDA.

To achieve independent estimates of changes to NIFMS, we used a sampling of the historical data to calibrate the SLIM software cost-estimating model and produce estimates on the number of lines of code generated to change or create programs of various sorts (see Appendix

E-1). Then we used CDA estimates of the scope of changes (number of new or modified programs required to add or modify capabilities) as inputs to SLIM. SLIM predicted the number of lines of code required and the costs of making those changes, based on past NIFMS CDA and contractor performance. Because the model was calibrated with historical data, we were able to produce statistical estimates at the 50 percent and 90 percent confidence levels.

This methodology was used to estimate the cost of changes to NIFMS for DFAS upgrades, business practice enhancements, and the NIFMS portion of establishing automated interfaces to other systems.

The specific analyses methods used to estimate each category of investment cost are described below.

The costs of DFAS *upgrades* were estimated by using CDA estimates of the number of new and modified programs required to correct each deficiency as inputs to the SLIM model. The model was used to predict the costs and duration of the effort.

The costs of business practice *enhancements* were handled in the same manner.

The costs of establishing automated *interfaces* to new systems were estimated by considering each side of the interface (NIFMS and each other system separately). For each interface, data flows and specific functions to be accomplished were identified. For the NIFMS side of the estimate, we used SLIM to predict a batch program change for each function identified. For the non-NIFMS side of each interface, we used standard function point analysis to estimate the lines of code required.[1] [8] SLIM was then used to predict the costs of these changes making the assumption that the other organizations performed similarly to the NIFMS CDA.

A different approach was necessary to determine *deployment* costs. Two primary groups are involved in deployment to each site — the site (including its DFAS support) and the NIFMS CDA. Site costs vary with the size of the transition program management team and the number of people to be trained. The NIFMS CDA will establish a team for each site. These cost of the CDA team will vary little from site to site.

Local site deployment costs were estimated by interviewing a variety of sites and by querying the NIFMS CDA on past deployments. Site costs can be grouped in two categories: local program management and trainee time. Training will be provided by CDA personnel.

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[1]Jones, Capers, *Programming Productivity*, McGraw Hill, Inc., 1986.

There was general consensus on the makeup of site program management teams with four-person teams of local personnel at smaller sites and eight-person teams at larger or more complex sites. These teams will be composed of about half functional and half technical personnel working full-time for the last six months prior to and one month following deployment and half-time the preceding six months. This team also would be responsible for site support for data conversion, local interfaces, testing, training, and, of course, program management. Costs of this support are estimated at $250,000 for the four-person teams and $510,000 for the eight-person teams. Details on these and other notional deployment costs are contained in Appendix E-2.

Local trainee costs were calculated by computing time spent in training for personnel in various pay grades. Sites identified the number and grade of trainees for training in each of four categories: managers, accounting (full training), accounting (partial training), and incidental users. These were used along with course lengths to calculate trainee costs. There was a great deal of consistency in the number and grades of trainees in each category as a percentage of the total depot work force. These percentages were used to estimate trainee costs for sites that did not provide input on the number of trainees.

CDA deployment costs are expected to be standard across most sites at under $1 million per site. These costs fall into three categories:

- *Data conversion.* A data conversion team provides all technical preparation for the site-deployment including building local interfaces and writing data conversion programs and tests. Starting one year prior to deployment the team begins to determine detailed requirements. The bulk of the development effort occurs in the six months prior to deployment.

- *Adaptation of training.* A small effort is required to tailor existing training courses to each site. Actual training will be accomplished by on-site support personnel (see below).

- *Technical support.* Technical support is provided by two teams: start-up and on-site support. The start-up team is composed of technical personnel who load NIFMS, convert data, and resolve any initial problems. A functional team provides training, answers functional questions, and serves as liaison to CDA technical personnel. It will be on-site for the first three months following deployment.

Assumptions Affecting Investment Costs

LMI made several assumptions to estimate investment costs. Most significant among these are the following.

- Standard business practices and standard feeder systems are not being mandated as part of the NIFMS deployments.

- Past NIFMS performance is indicative of future performance. This assumption was necessary to estimate the cost of changes to NIFMS.

- Various NIFMS projects are independent of each other. A variety of projects will be underway at the same time (e.g., normal maintenance, R&D deployments, DFAS upgrades, and depot deployments). The impact of this multiplicity of efforts is unknown but could adversely impact the cost, schedule, and risk of each. (See the issues section at the end of this chapter.)

- The CDA's site deployment costs will vary little from site to site. This assumption is based on past NIFMS deployments and might not reflect the learning curve available if the same CDA team supports deployment to multiple sites using the current system. The NIFMS CDA made a strong case for the conservative (no learning curve) approach.

- Existing (legacy) systems will be shut off entirely. Thus, any functionality embedded in those systems must be replaced, creating the need for significant business practice enhancements to NIFMS for the NOC and NSY deployments.

Recurring Operating and Support Costs — Analysis Methods and Assumptions

The systems maintenance cost estimates under NIFMS assume some growth in the NIFMS CDA for new organization support based on the complexity of unique business practice enhancements and number of new interfacing systems to be supported. This growth is necessary because standard business practices and standard nonfinancial feeder systems are not being mandated as part of this deployment. Except for the MCLBs, which have received little CDA support in the past, the estimated growth in the NIFMS CDA will cost less than the cost of the CDA for the existing system.

The cost of accounting services will not change as a result of the NIFMS deployments.

The cost of computer operations support is based on DISA billings for NIFMS at the NADEPs. The range of these billings ($300,000 to $1 million per year) was scaled by depot size (employment) and complexity of workload (high or low end of the range) to estimate future DISA billings. Actual DISA costs and detailed technical estimates of numbers of transactions, database sizes, and computer processing requirements that might otherwise have been used to provide more

detailed cost estimates were unavailable. Those technical requirements are normally computed as part of the preparations for system deployment.

BASELINE NIFMS AND DFAS UPGRADES

Baseline NIFMS

NIFMS is the financial management part of the Naval Aviation Depot Information Management (NADIM) suite of systems. NIFMS supports the six NADEPs, three of which are scheduled to close under the base realignment and closure (BRAC) process. It contains about 2.6 million lines of COBOL code and runs on UNISYS mainframe computers at DISA's Jacksonville and San Diego megacenters. All accounting support for the NADEPs is provided by DFAS personnel at the Operating Location, San Diego. Both depot and DFAS personnel use NIFMS. (See Figure 4-2).

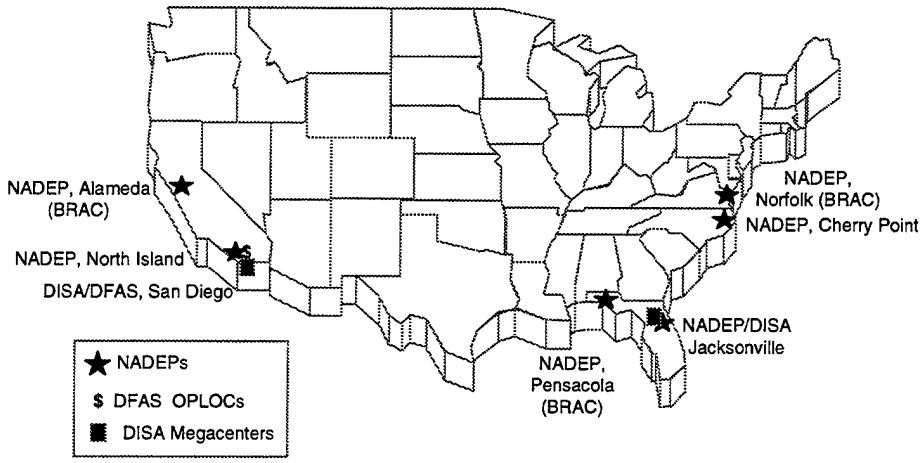


Figure 4-2.
Baseline NIFMS

NIFMS was deployed to the NADEPS starting in 1985 using a strategy like the one described above. Strict configuration control of NIFMS is maintained by the NIFMS CDA; sites are not authorized to modify the code, although they do schedule the periodicity of their own runs.

The NADIM suite consists of a variety of other systems, most notably the Workload Control System (production and labor) and the NAVAIR Industrial Material Management System. Figure 4-3 depicts the interfaces between NIFMS, the other parts of the NADIM, and other feeder and reporting systems. As NIFMS is deployed to new organizations, similar interfaces will have to be established between NIFMS and those

organizations own suite of systems. (See similar figures in the sections on the MCLBs, NOCs, and NSYs.)

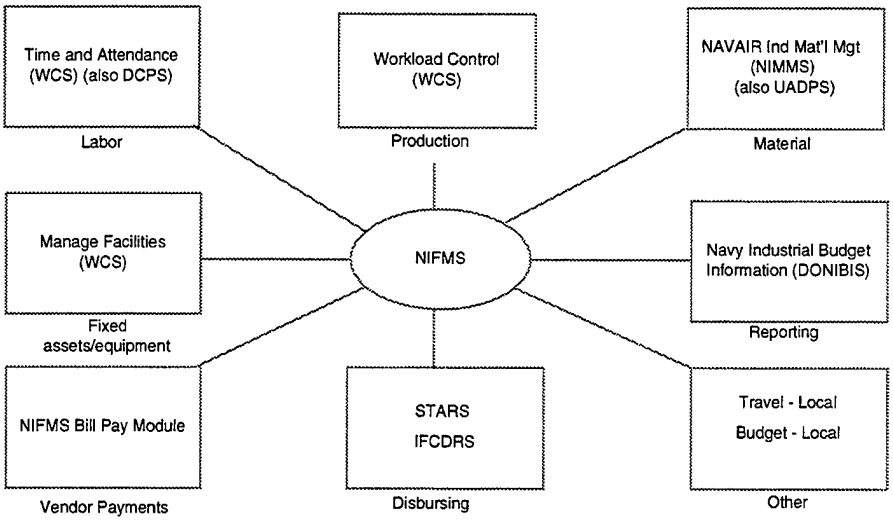


Figure 4-3.
Baseline NIFMS Interfaces

CURRENT OPERATING AND SUPPORT COSTS

System Maintenance

The NIFMS Central Design Activity is part of the Naval Aviation Depot Operations Center located at Patuxent River, Md. It is a fee-for-service organization with approximately 25 government and 50 contractor-support personnel. The CDA performs most system engineering and design functions, with the majority of programming accomplished by a support contractor. The current support contract is expiring; a new contract award is in progress.

The FY95 budget for the NIFMS CDA was $5 million. The $5 million represents normal system activity (maintenance and limited upgrading of capabilities) and is the baseline for this analysis. The CDA will have to grow as it undertakes new development and support of new organizations, which means that its annual budget will have to grow beyond $5 million.

Computer Operations

Computer operations support for NIFMS is provided at the two DISA megacenters with UNISYS machines — Jacksonville and San Diego. All future deployments of NIFMS (mainframe version) will be accomplished using machines at one of these two locations.

NIFMS-related DISA charges for the NADEPs vary from $0.3 million to $1.0 million annually per site, a total of $2.2 million for the NADEPS that will remain open. These charges are the basis of our estimated O&S costs for computer support for the other Navy depots.

As currently configured, NIFMS requires a different mainframe central processing unit (CPU) for each NIFMS database (one per site). This restriction is due to NIFMS' use of common file names, not CPU usage. Planned NIFMS deployments would require DISA to purchase additional processors, operating systems, and communication software licenses if this requirement is not relaxed. If the restriction is removed, DISA estimates that it would have to add few, if any, additional processors. The cost of modifying NIFMS is estimated by the CDA at less than $1 million. This cost is offset by savings at the *first* deployment site for which DISA would have to add an additional processor.

DFAS has agreed to fund the modification of NIFMS to remove the one-NIFMS-per-processor restriction. This modification should keep the NIFMS deployments associated with this study from significantly driving up DISA's costs, which will benefit all DISA's UNISYS customers.

DFAS Upgrades

As a result of the functional review of NIFMS, DFAS identified 76 areas where NIFMS did not provide the desired level of functionality. LMI estimates the one-time investment cost to correct those deficiencies at $3.0 million at the 50 percent confidence level, and $4.0 million at the 90 percent confidence level (A 90 percent confidence level, for example, means that the cost is 90 percent likely to be less than equal to $4.0 million). Appendix B lists all DFAS-identified deficiencies. LMI recommended dropping several requirements that were judged to be unnecessary and costly. DFAS accepted our recommendation, which resulted in cost avoidance estimated at nearly $2 million.

Adding the new functionalities to NIFMS began in early FY96 and will take approximately two years to complete. LMI analyzed whether additional staffing could compress the schedule from the two years necessary to make all upgrades to provide full DFAS functionality. The results indicate that the schedule can be compressed only slightly (about three months), but that the costs could double.

Summary

Investment costs for DFAS upgrades and annual NIFMS O&S costs for fixed CDA functions and NADEP support and operations are summarized in Table 4.3.

Table 4-3.
Cost of DFAS-Required Upgrades and Baseline NIFMS

Description	Cost in $ millions
Investment	
DFAS-required upgrades	$3.0 (50%) to $4.0 (90%)[a]
Annual operating and support costs	
Before upgrades	$7.2
After upgrades	$7.2
Net change	none

[a] Percentages refer to degree of confidence in the cost estimate.

NIFMS TO THE MCLBs

Baseline System

The Marine Corps Industrial Fund System (MCIF) supports the two MCLBs. Each of these is a small activity with about one thousand employees (about one-third the size of the smallest of the NADEPs). MCIF is a COBOL-based system operating on an IBM mainframe computer. Computer processing for MCIF is provided by the DISA Defense megacenter located at St. Louis, Mo. With the conversion of MCLBs to NIFMS, the computer support for those sites will be provided at a location determined by DISA. The Defense Accounting Office that performs the DBOF accounting functions for the two depots is located at Albany, Ga. (See Figure 4-4.)

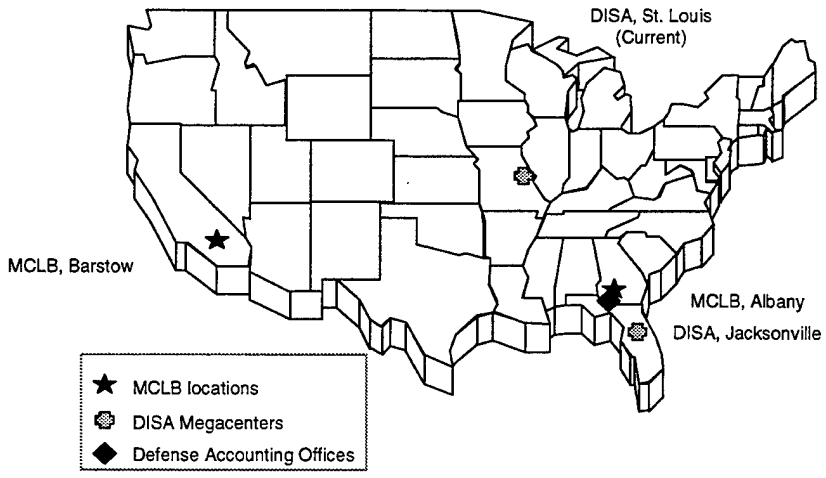


Figure 4-4.
Baseline MCIF and NIFMS at the MCLBs

BASELINE ANNUAL OPERATING AND SUPPORT COSTS

Current O&S costs for MCIF are estimated at $150,00 per year. O&S costs for system maintenance were not directly available. The CDA at Quantico, Va., has provided minimal support for MCIF, which is estimated at less than one percent of their workload or less than one-half person-year ($50,000 annually). DISA billing for MCIF is about $100,000 per year.

Replacing MCIF with NIFMS

Efforts to replace MCIF with NIFMS at the MCLBs are underway with Albany scheduled to be operational early in FY97 and Barstow to follow one quarter later. The MCLBs are considered to be a high priority for NIFMS deployment because the existing accounting systems (MCIF and several microcomputer-based applications) lack many required capabilities. The MCLB deployments are simplified somewhat in that there are no required business practice enhancements and the MCLBs also will be deploying the NIMMS.

INVESTMENT REQUIRED

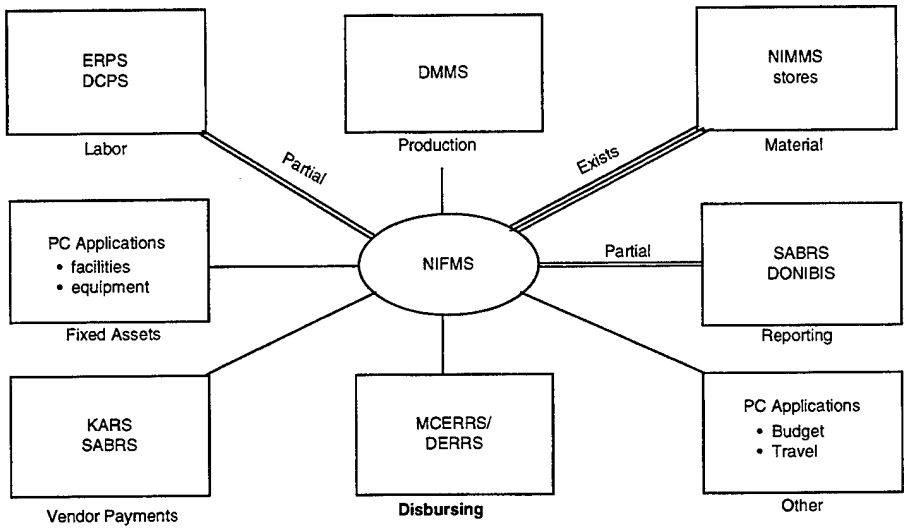
Investments are required to establish interfaces to existing Marine Corps systems and to deploy NIFMS to the two MCLBs.

Interface Costs

Eight new automated interfaces are required to implement NIFMS at the MCLBs as illustrated in Figure 4-5. Four files within the Depot Maintenance Management System (DMMS) will interface with the Job Order Work File within NIFMS. The time and attendance data collection system to be used has not been selected; however, a standard interface will have to be provided. For costing purposes, we used the NOC's current time and attendance system [Standard Labor Data Collection and Distribution [SLDCADA]) as a proxy for the new system because it provides similar capabilities to any of the options being considered by the Marine Corps for use at the MCLBs.

The Marine Corps Expenditure and Reimbursement Reporting System (MCERRS) handles expenditure and collection data. Costing of interfaces for payment prevalidation and for all financial reports and statements was done in accordance with the concept plan for the Marine Corps Standard Accounting, Budgeting and Reporting System (SABRS), which is scheduled to deploy soon after NIFMS comes on line. Four

operations (travel, budget, facilities, and equipment) are supported on personal computer (PC) applications.



Notes:

- Production/labor - Essex Replacement System (ERPS)
- Production/cost structure - Depot Maintenance Management System (DMMS)
- Material - NAVAIR Industrial Financial Management System.(NIMMS)(existing)
- Fixed Assets/equipment - microcomputer applications
- Reporting - Marine Corps Standard Accounting, Budgeting and Reporting System (SABRS)
- Reporting - Dept. of Navy Industrial Budget Information System (DONIBIS) (existing)
- Vendor payment - Kodak Automated Retrieval System and SABRS (KARS)
- Disbursing - Marine Corps Expenditure & Reimbursement Reporting System (MCERRS)
- Disbursing - Departmental Expenditure and Reimbursement Reporting Subsystem (DERRS) (replacement for MCERRS).

Figure 4-5.
NIFMS Interfaces Required at the MCLBs

The investment cost estimates to establish these interfaces are shown in the Table 4-4.

Table 4-4.
Investment Cost Estimates
($ millions)

MCLB interface cost	50% confidence	90% confidence
NIFMS side	0.3	0.3
Non-NIFMS side	0.3	0.5
Total	0.6	0.8

Deployment Costs

Deployment costs for NIFMS to the MCLBs is estimated at $2.3 million. Of this, $1.6 million is for CDA costs and $700,000 is for site costs. Site costs are part of the Marine Corps base operation cost and are included in overhead costs of the DBOF. Site costs are broken into two categories:

- Program management was based on an eight-person team working half-time for the first six months of the year and full-time for the six months prior to implementation. This eight-person team is for both Marine Corps sites.

- Cost of trainees is based upon the number of trainees identified by the Marine Corps and DFAS. Most training of accounting personnel will occur at Albany, Ga., which will require some personnel to travel from Barstow, Calif.

Annual Operating and Support Costs

Annual operating and support cost is estimated to be $400,000. Of this, $200,000 is for CDA support (liaison and MCLB suite management). An additional $200,000 is the estimate for DISA charges. This figure was based on the total work force being about two-thirds the size of a small, simple NADEP with DISA billings of $300,000 per year.

Summary

Total investment to deploy NIFMS to the MCLBs is estimated at $2.9 million to $3.1 million as illustrated in Table 4.5.

Table 4-5.
Total Investment Costs
($ millions)

MCLB investment category	50% confidence	90% confidence
Enhancements	0.0	0.0
Interface Cost	0.6	0.8
Deployment	2.3	2.3
Total	2.9	3.1

Note: Deployment cost confidence intervals are not statistically computed.

Annual operating and support costs are estimated at $400,000, an increase of $250,000 over the baseline system, which has received little CDA support, as shown in Table 4-6.

Table 4-6.
Operating and Support Cost Estimates

MCLB	Baseline Cost	NIFMS Cost
System maintenance (CDA support)	$50,000	$200,000
Computer operations (DISA)	$100,000	$200,000
Total	$150,000	$400,000
(Net increase over baseline)	N/A	$250,000

NIFMS TO THE NOCs

Baseline System

The Naval Ordnance Management Information System (NOMIS) is the financial system to be replaced by NIFMS at the NOCs. The five NOCs are organized under two commands, NOC Atlantic (at Yorktown, Va.) and NOC Pacific (at Seal Beach, Calif.). Additionally, accounting for the Naval Warfare Assessment Center, Corona, is provided by NOC Pacific. All comptroller functions are consolidated at NOC Atlantic and NOC Pacific. By the time NIFMS would deploy to the NOCs, each command will have all financial data in a single database. Therefore, NIFMS only needs to be deployed to two sites, NOC Atlantic and NOC Pacific. Some training will also need to be accomplished at the other four sites in conjunction with the NIFMS deployment. Each of the two coastal organizations, NOC Atlantic and NOC Pacific, is roughly equivalent to the size of a small NADEP.

NOMIS operates on Honeywell mainframes operated by the Navy. GSA will not authorize operation of those mainframes after FY96. NOMIS has been modified to run on client-servers; however, this modification did not include significant reengineering either to take advantage of the client-server environment or to improve its accounting functionality. It will be deployed to NOC Atlantic and NOC Pacific prior to removal of the Honeywell computers. For purposes of estimating baseline operating and support costs, LMI used the estimated costs of operating the client-server version of NOMIS since that is the system that will be replaced by NIFMS; those estimated costs are reflected in NOC budgets. DISA does not provide computer support to the NOCs, but it would when mainframe NIFMS is deployed.

The fact that NOMIS has not been reengineered is significant. It still is written in COBOL, and the database structure has not been upgraded. Many of the benefits often attributed to client-server applications, such as

higher productivity of programmers and ease of system changes, will not be available on the client-server version of NOMIS.

Accounting functions for the NOCs are performed by the nearest DFAS Operating Location or Defense Accounting Office. DFAS consolidation is likely but is independent of this study. Figure 4-6 illustrates the location of these activities.

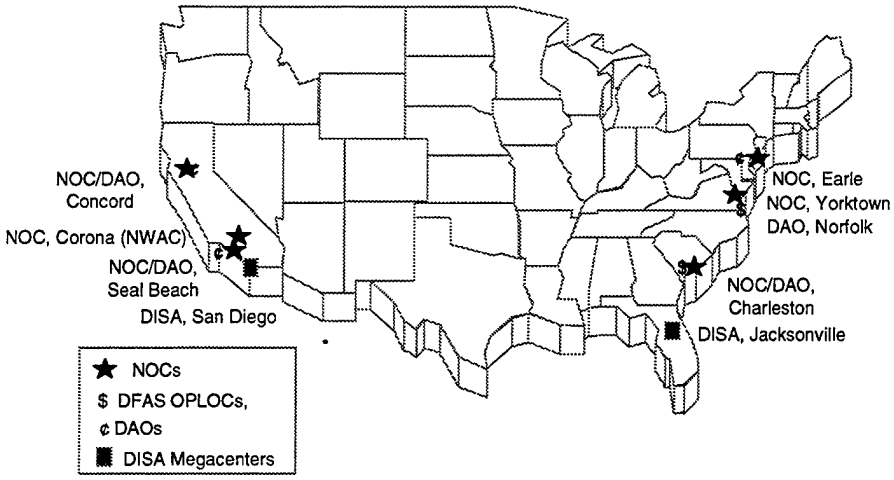


Figure 4-6.
Baseline NOMIS and NIFMS at the NOCs

BASELINE ANNUAL OPERATING AND SUPPORT COSTS

The baseline O&S cost estimate for NOMIS is $500,000 per year based on estimates for the client-server version of NOMIS being deployed. System maintenance support by the CDA at Yorktown costs $400,000 annually. The NOMIS share of NOC client-server operations is estimated to be $100,000 per year. For comparison, the mainframe version of NOMIS had computer operations costs of $300,000 per year.

Replacing NOMIS with NIFMS

INVESTMENT REQUIRED

All three categories of investment costs — *enhancements, interfaces, and deployment* — are required by the NOCs. However, because several of the laboratories in the R&D business area use NOMIS and require the same enhancements and interfaces as the NOCs, all those costs are shared costs.

Enhancement Costs

A total of 21 enhancements are required by the NOCs, 20 of which are also required by the labs using NOMIS. The costs of these enhancements will be between $2.2 and $2.9 million, almost all of which are shared with the R&D community, as shown in Table 4-7. Several individual enhancements, such as changing the NIFMS job order structure, are quite costly. Appendix E-5 contains a complete listing of the required enhancements and their projected costs.

Table 4-7.
Enhancement Costs
($ millions)

NOC enhancement costs	50% confidence	90% confidence
Total	2.2	2.9
Shared by R&D	2.2	2.8
Incremental	0.0	0.1

Interface Costs

Deploying NIFMS to the NOCs requires the following eight new interfaces as illustrated in Figure 4-7:

- Production/labor - Standard Labor Data Collection and Distribution (SLDCADA) System
- Production/cost structure - Charge Number Automation System (CNAS)
- Material - Integrated Logistics Supply Management Information System (ILSMIS)
- Fixed assets/equipment - Consolidated Resources Information Support System (CRISS)
- Vendor payments - Industrial Disbursing and Accounting (IDA) system
- Budget - Automated Budget System (ABS)
- Travel
- Local - Unique to mission of Charleston NOC.

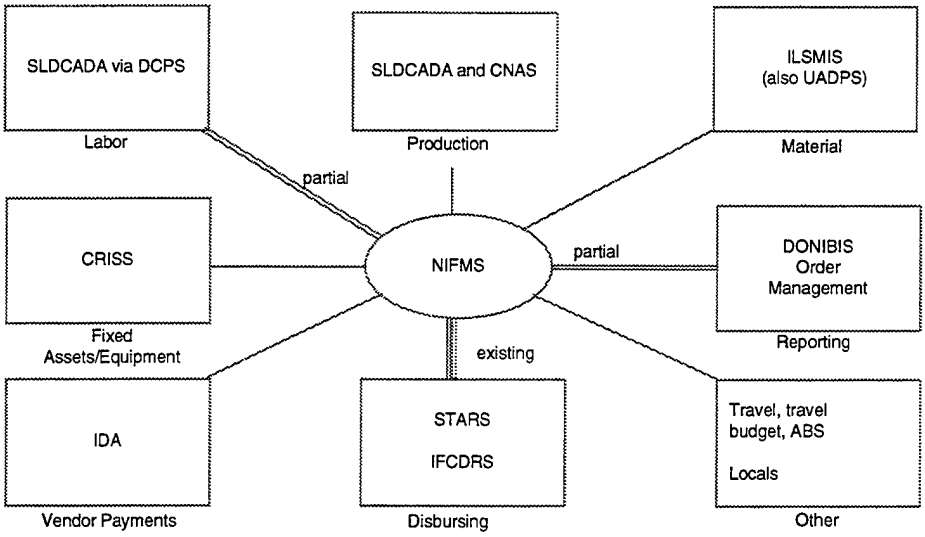


Figure 4-7.
NIFMS Interfaces Required at the NOCs

The estimated costs of establishing these interfaces are shown in Table 4-8.

Table 4-8.
Investment Costs for Interfaces
($ millions)

NOC interface costs	50% confidence	90% confidence
NIFMS side	0.3	0.4
Non-NIFMS side	0.4	0.8
Total	0.7	1.2
Shared with R&D	0.6	1.1
Incremental depot maintenance costs	0.1	0.1

Deployment Costs

One-time costs for deployment are estimated at $2.7 million. Of that, $2.0 million is for CDA costs and $700,000 is for site costs. Of the $700,000 in site costs, $500,000 is for program management, data conversion, testing, and associated travel, and $200,000 is for trainee labor. Those costs represent major deployments to NOC-Atlantic and NOC-Pacific with some limited costs ($100,000 total) to support the four other feeder sites. Appendix E-2 provides information on the derivation of the deployment costs. Trainee labor costs were estimated based on NOC projections of the number of trainees needed.

Total annual O&S under NIFMS is estimated at $900,000. Of this, $300,000 per year is for CDA support (liaison, business expertise, and NOC suite management). An additional $600,000 per year is the estimate for DISA charges. This latter figure was based on the total work force of NOC-Atlantic and NOC-Pacific, each being equivalent in size and complexity to a small, simple NADEP with DISA billings of $300,000 annually.

Summary

The incremental, one-time cost of deploying NIFMS to the NOCs is $2.8 million to $2.9 million. An additional $2.8 million to $3.9 million investment is also required for the R&D deployments as shown in Table 4-10.

Table 4-10.
NIFMS Deployment Costs
($ millions)

NOCs	Total		Shared with R&D		Incremental	
Confidence level	*50%*	*90%*	*50%*	*90%*	*50%*	*90%*
Enhancements	2.2	2.9	2.2	2.8	0	0.1
Interfaces	0.7	1.2	0.6	1.1	0.1	0.1
Deployment	2.7	2.7	0	0	2.7	2.7
Total investment	5.6	6.8	2.8	3.9	2.8	2.9

Note: Deployment cost confidence intervals are not statistically computed.

Annual O&S incremental costs for NIFMS at the NOCs is estimated at $900,000 an increase of $400,000 over NOMIS client-server, which it will replace. See Table 4-11.

Table 4-11.
NIFMS to NOCs O&S Costs

NOCs	Baseline cost	NIFMS cost
System maintenance (CDA support)	$400,000	$300,000
Computer operations (DISA)	$100,000	$600,000
Total	$500,000	$900,000
Net increase over baseline	N/A	+$400,000

Both investment and annual O&S could be reduced if an open-systems version of NIFMS were deployed to the NOCs instead of the mainframe-based version of NIFMS. This issue is discussed toward the end of this chapter.

NIFMS TO NSYs

Baseline System

The Shipyard Management Information System (SYMIS) Financial Modules (FA/FV/FR) will be replaced by NIFMS at the shipyards. Four Naval Shipyards will remain open after BRAC' 95 closures. They are Norfolk, Va.; Portsmouth, N.H.; Puget Sound, Wash.; and Pearl Harbor, Hawaii. The shipyards are the largest of the Navy maintenance depots (4,000 to 10,000+ employees each). The four shipyards at Philadelphia, Pa.; Charleston, S.C.; Mare Island, Calif.; and Long Beach, Calif.; will be closed and, therefore, were excluded from this analysis. Those sites will continue to use legacy systems until closed.

SYMIS operates on Honeywell mainframe computers operated by the Navy. GSA has not authorized the Navy to continue operating those mainframes after FY96. Therefore, SYMIS is being modified, with some reengineering, to run on client-servers. It will be deployed to NSYs this fiscal year prior to removal of the Honeywell computers. For purposes of estimating baseline operating and support costs, LMI used the estimated costs of operating the client-server version of SYMIS since that is the system that will be replaced by NIFMS; those estimated costs are reflected in NSY budgets. DISA does not provide megacenter support to the shipyards but would when mainframe-NIFMS is deployed.

Accounting functions are performed by the nearest DFAS Operating Location or Defense Accounting Office. DFAS consolidation is likely but is independent of this study. Figure 4-8 illustrates the locations of these activities.

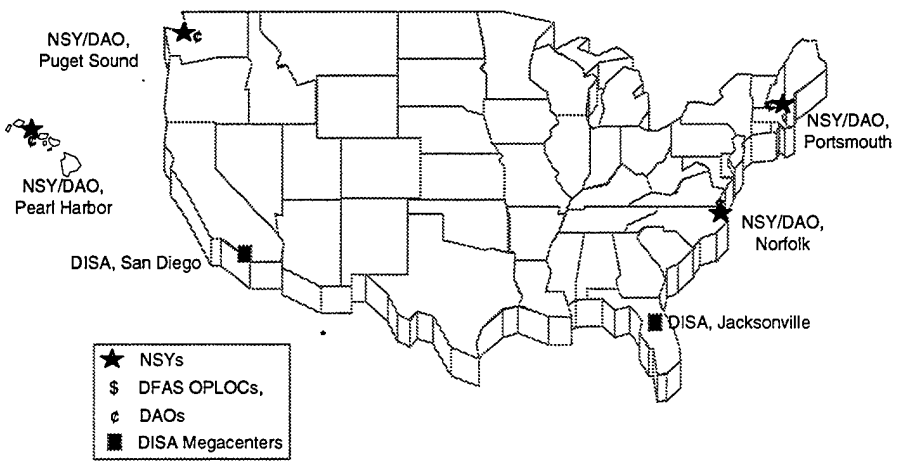


Figure 4-8.
Baseline SYMIS and NIFMS at the NSYs

BASELINE ANNUAL OPERATING AND SUPPORT COSTS

The baseline O&S cost estimate for SYMIS financials is $1.8 million per year, based on estimates for the client-server version of SYMIS financials being deployed. System maintenance support by the CDA at Indian Head costs $1.4 million annually. The SYMIS financial's share of NSY client-server operations is estimated at $400,000 per year. For comparison, the mainframe version of SYMIS had an annual computer operations cost of $1.3 million.

Replacing SYMIS Financials with NIFMS

INVESTMENT REQUIRED

All three categories of investment costs — enhancements, interfaces, and deployment — are required by the shipyards.

Enhancement Costs

Major differences in the business practices of the NSYs and the NADEPs will require enhancements to NIFMS costing $3.7 million to $5.3 million at the 50 and 90 percent confidence levels. Some of the major enhancements include database changes to accommodate differing job order, job status, and organizational codes; incoming data validation; pro-ration of work among multiple customer orders; and others. Appendix

E-5 contains a complete listing of enhancements required by the shipyards and their estimated costs.

Interface Costs

Deployment of NIFMS to the shipyards requires 22 new interfaces as illustrated in Figure 4-9 and listed below:

- **Labor** (3): Supervisor Desk (SUPPOSED); Automated Time and Attendance Muster System (ATAMS); Pre/Post-Payroll (SYMIS FP)
- **Production** (6): Baseline Advanced Industrial Management (BAIM); Production Control; Fundamental Accounting and Scheduling System (FASS); Unallocated Cost Application (SYMIS LVU); Performance Management Control (PMC); Machine Shop Tracking System (MSTS)
- **Material** (4): Material Management (SYMIS MM); Shop Stores (SYMIS MS); Supply System (SYMIS SS); Accounts Payable Reconciliation (SYMIS MP)
- **Fixed assets/equipment** (1): Plant Property Management System (PPMS)
- **Vendor Payments** (1): Material Disbursing (SYMIS MD)
- **Reporting** (4): NAVSEA; Ship Alterations and Repairs (SARP); Shipyard Managers; Shipyard Comptroller
- **Budget** (1)- Standard Automated Budget Reporting System (SABRS) — not the same as the Marine Corps System with the same acronym
- **Travel** (1): Travel
- **Other** (1): Base Engineering Systems, Technical (BEST).

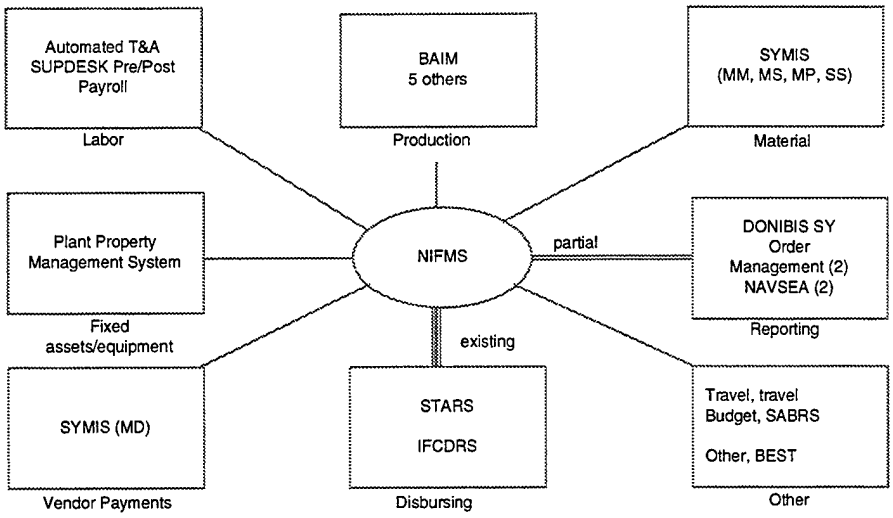


Figure 4-9.
NIFMS Interfaces Required at NSYs

The estimated cost of establishing these interfaces is shown in Table 4-12.

Table 4-12.
NIFMS to NSYs Interface Costs
($ millions)

NSY interface cost	50% confidence	90% confidence
NIFMS side	0.6	0.9
Non-NIFMS side	0.8	1.1
Total	1.4	2.0

Deployment Costs

One-time costs for deployment are estimated at $6.6 million. Of that, $3.8 million is for CDA costs and $2.8 million is for site costs. Of the $2.8 million in site costs, $2.0 million is for program management, data conversion, testing, and associated travel; and $800,000 is for trainee labor and travel. Appendix D provides information on how deployment costs were derived. Trainee labor costs were estimated on the basis of shipyard input of the number of trainees for three of the shipyards. LMI estimated trainee labor hours for the remaining shipyard based on its work force and percentages of the work force to be trained identified at other shipyards, NOCs, and MCLBs — all of whose statistics were fairly consistent over time.

Annual O&S under NIFMS is estimated at $6.6 million total. Of this, $1.0 million is for CDA support (liaison, business expertise, and NSY suite management). DISA charges were estimated at $5.6 million per year by multiplying the workload at a large NADEP by a factor equal to the ratio of the shipyard man-years to the NADEP man-years.

Summary

Naval shipyards require an investment of $11.7 million to $13.9 million to provide unique business practice enhancements, interface to shipyard systems, and deploy to the four shipyards (Portsmouth, N.H.; Norfolk, Va.; Puget Sound, Wash.; and Pearl Harbor, Hawaii) as shown in Table 4-13.

Table 4-13.
NIFMS to NSYs Investment Costs
($ millions)

NSYs investment category	50% confidence	90% confidence
Enhancements	3.7	5.3
Interface cost	1.4	2.0
Deployment	6.6	6.6
Total	11.7	13.9

Note: Deployment cost confidence intervals were not statistically computed.

Operating and support costs will *increase* by approximately $4.8 million per year, largely because mainframe-computer operations (NIFMS) are more costly than the mid-tier (client-server) operations they will replace (see Table 4-14).

Table 4-14.
NIFMS to NSYs Annual O&S Costs
($ millions)

Naval shipyards	Baseline cost	NIFMS cost
System maintenance (CDA support)	1.4	1.0
Computer operations (DISA)	0.4	5.6
Total	1.8	6.6
Net increase over baseline	N/A	+4.8

AN EXCURSION: NIFMS OSE

DFAS tasked LMI to evaluate the potential impact of deploying an open-systems-environment (OSE) version of NIFMS (if such a version were available) versus the current mainframe version to the NOCs and shipyards. This issue arose because those activities will be operating client-server versions of their financial systems by the time NIFMS would deploy.

LMI analyzed only the impact of deploying an OSE version of NIFMS on investment costs (upgrades, enhancements, and interfaces) and NIFMS O&S costs (computer operations). DFAS has sponsored a separate study addressing the cost and benefits of converting NIFMS to OSE.

We use the phrase "open systems" to denote more than simply a client-server-based system. We use the term to mean a reengineered NIFMS that is platform-independent with a modern database; a modern, powerful programming language such as C++; and a full set of advanced software tools.

This section documents that analysis.

Investment Cost Impacts

The major impacts of systems development under OSE versus similar requirements being accomplished for older (COBOL) systems are three-fold:

- *Lines of code* needed to provide the necessary functionality is reduced due to more powerful languages, databases, and tools. Thus, the total workload is reduced.

- *Productivity* of systems programmers and analysts is improved due to the same factors. In other words, less time is required to write an equal number of lines of code in OSE than in an older (COBOL) language. (In addition, an equivalent functionality will also require fewer lines of code).

- *Labor cost* (hourly rate) increases will offset some of the first two benefits. Systems development under an OSE environment tends to have higher labor costs per hour than systems development in a COBOL environment.

The net result is still a substantial reduction in costs for adding new functionalities to a system.

To conduct the analysis, we made the following assumptions about the relative impacts on systems development on an OSE version of NIFMS as compared to the current COBOL version of NIFMS:

- Source lines of code under an OSE will be reduced by at least 28 percent. This number is supported by current literature (25 percent-75 percent reduction) and by the experience of various organizations in business and government on similar systems (28 percent reduction).

- Productivity will improve substantially, but with wide variance. Adjustments were made to our model to accommodate this. The reduced lines of source code required to make changes reduces the productivity gains somewhat because smaller programs tend to have higher per-line costs (more overhead).

- Labor rates will increase 20 percent. This is equivalent to an increase from either the 25th percentile to the 50th percentile or from the 50th percentile to the 75th percentile, both in terms of salaries of systems personnel.

The net result of doing the systems development to meet DFAS , NOC, and NSY requirements could be $5.4 million lower under OSE-NIFMS than under mainframe (COBOL) NIFMS as shown in Table 4-15. Deployment costs would not change significantly. The MCLBs will deploy mainframe NIFMS before any OSE version could be made available.

Table 4-15.
Comparison of NIFMS Development Costs under Mainframe and Open Systems Environments ($ millions)

Investment category	Cost for mainframe NIFMS	Cost for OSE NIFMS	Potential savings
DFAS-required upgrades	3.0 - 4.0	2.3 - 3.2	0.7 - 0.8
NIFMS to the NOCs	5.6 - 6.8	4.8 - 5.7	0.8 - 1.1
NIFMS to the NSYs	11.7 - 13.9	8.8 - 10.4	2.9 - 3.5
Total	20.3 - 24.7	15.9 - 19.3	4.4 - 5.4

Note: Range represents 50% to 90% confidence levels in the cost estimates.

Any development (upgrade, business enhancement, or interface) accomplished on the mainframe version of NIFMS would reduce the amount of this savings.

Operating and Support Cost Impacts

Conversion to open systems will reduce NIFMS O&S costs substantially. Although the conversion should reduce CDA costs for maintenance and development, LMI could not quantify this reduction. Computer services would cost substantially less for organically owned and operated client-servers than projected DISA mainframe charges. The estimated O&S at the NOCs and shipyards are shown in Table 4-16. Savings over O&S costs for mainframe NIFMS computer operations could be $4.7 million per year. These saving are based on the assumption that the OSE version of NIFMS will cost about the same to operate as the client-server versions of NOMIS and SYMIS financials. These savings could change if DISA were to operate the client-servers and to apply DISA overhead rates to their billings.

Table 4-16.
Comparison of NIFMS Mainframe and OSE Annual Computer Operations Costs at the NOCs and NSYs
($ millions)

Activity	Mainframe NIFMS	OSE NIFMS	Savings
NOCs	0.6	0.1	0.5
Shipyards	5.6	0.4	4.2
Total	6.2	0.5	4.7

Summary

The net result of deploying an open-systems version of NIFMS as compared to mainframe (COBOL) deployment of NIFMS is to reduce both required investment and operating and support costs. These benefits must be weighed against the delays necessary (which is estimated at two or more years) to field an open-systems version of NIFMS. If NIFMS is converted to OSE at some point (on its own merits), it is advisable to do so as soon as practical. Then, system changes could be accomplished under the new, more efficient environment.

SUMMARY AND ISSUES

Summary

The total one-time investment required to upgrade and deploy NIFMS is $23.2 million to $27.8 million ($17.4 million to $19.9 million above R&D

requirements). Annual operating and support costs under NIFMS will be $15.1 million, an increase of $5.5 million above the cost of the legacy systems NIFMS will replace.

- *DFAS upgrades* will cost $3.0 million to $4.0 million. Those upgrades will provide the additional functionalities required by DFAS. All of these costs are shared with the R&D deployments. No change is anticipated in the current $7.2 million *baseline O&S* costs for basic NIFMS CDA functions and computer support for the NADEPS.

- *Marine Corps logistics bases* will require an investment of $2.9 million to $3.1 million. Annual O&S costs will *increase* by approximately $250,000 per year mostly to provide CDA support in this new environment.

- *Naval ordnance centers* will require an incremental investment of $2.8 million to $2.9 million. An additional $2.8 million to $3.9 million is required but is shared with the R&D deployments. Total investment required is $5.6 million to $6.8 million. Operating and support costs will *increase* by $400,000 per year largely because mainframe computer operations (NIFMS) are more costly than the mid-tier (client-server) operations they will replace.

- *Naval shipyards* will require an investment of $11.7 million to $13.9 million. Operating and support costs will *increase* by approximately $4.8 million per year largely because mainframe computer operations (NIFMS) are more costly than the mid-tier (client-server) operations they will replace.

Issues

LMI identified several issues during the course of this study. Several have been resolved such as assigning a Navy program manager, dropping some unnecessary and costly DFAS requirements, and authorizing technical modifications to NIFMS to remove the restriction that only one NIFMS database could be maintained by a single processor. Several others are yet to be resolved. These are discussed briefly below.

Are NIFMS deployment plans and schedules realistic?

The DFAS and DBOF Corporate Board should reduce the number of concurrently scheduled projects at the NIFMS CDA. Current plans call for many efforts — DFAS-required upgrades, development of NIFMS enhancements and interfaces for multiple sites, deployment of NIFMS to multiple sites (both DMBA and R&D), normal maintenance, and perhaps conversion of NIFMS to an open-systems environment — to be accomplished in parallel. These multiple efforts will likely increase the

costs, delay the schedule, and increase the risk of each individual effort. For example, we estimate that the business practice enhancements for the NOCs will take almost two years to develop. Those same enhancements are required by an R&D site scheduled for NIFMS implementation in less than one year.

Will NIFMS be converted to an open-systems environment?

DFAS is evaluating the costs and benefits of converting NIFMS to an OSE. We have not estimated either the cost of converting NIFMS or how long that conversion would take. If NIFMS is ultimately converted to OSE, it makes sense to accomplish that conversion as soon as possible because subsequent investment and O&S costs for deploying NIFMS to other activities would be substantially reduced. The DFAS and the DBOF Corporate Board must weigh those benefits and the associated delay in deployment, while the OSE conversion takes place, against the desire to rapidly deploy standard financial systems.

Is it cost-effective to deploy NIFMS to the shipyards?

The DFAS and the DBOF Corporate Board should carefully weigh the benefits of standardization against the large investment costs and the increase in operating and support costs associated with deploying mainframe-NIFMS to the shipyards. Deploying an OSE version of NIFMS or upgrading SYMIS are options that should be investigated.

Chapter 5. Option One: Air Force

INTRODUCTION

DFAS recommended the Depot Maintenance Management Information System (DMMIS) financial subsystems as the standard accounting system for the Department of the Air Force's depot maintenance business area (DMBA).

Air Force DMBA Sites

There are five Air Logistics Centers (ALCs) in the Air Force's DMBA. Three of those centers — Ogden, Oklahoma City, and Warner-Robins — are candidates for DMMIS deployment. The other two, Sacramento and San Antonio, are scheduled to be privatized and therefore, there are no plans to deploy DMMIS to those sites.

Most accounting services for the ALCs are provided by DFAS employees at Defense Accounting Offices (DAOs) collocated at the ALCs. The remainder of accounting services is provided by San Bernadino for San Antonio, Sacramento, and Ogden; by Omaha for Oklahoma City; and by Limestone for Warner-Robins. DFAS-Denver has overall responsibility for Air Force accounting reports. It receives a trial balance for each ALC, and from the balances it produces the consolidated ALC report, other management reports; and the DD1307 report (income statement, financial position, cash flow position). The DD1307 drafts are sent to the ALCs for review and approval. Denver performs the roll-up to the Air Force.

Computer support for accounting operations is provided by DISA at Defense megacenters collocated with the ALCs. DISA provides the computer resources and personnel to operate the Air Force mainframe programs at the bases with depots and at Wright-Patterson Air Force Base.

Air Force DMBA Baseline Accounting System

Air Force DMBA accounting support is now provided by a large suite of legacy systems that provide both management and accounting functions. That suite has evolved for more than three decades. Some of the systems, such as the Industrial Fund General Ledger System (H069G), are dedicated to financial functions. Others, such as the Job Order Production Master System (G004L), are only partially financial. The recent *Transfer*

of Management Responsibility (TMR) study identified the amount of each Air Force data system that performs financial functions. [9]

We combined the results of the TMR study, our interviews with data system personnel, and our site visits to three depots to develop a list of the current Air Force data systems that contain significant DMBA accounting functions. Table 5-1 lists those data systems.

Table 5-1.
Air Force DMBA Legacy Financial Systems

Data system designator	System name
G035A	Depot Maintenance Budget & Management Cost System
H069G	Industrial Fund General Ledger System
G004B	Project Order Control System
G004H	Maintenance Actual Material Control System
G004L	Job Order Production Master System
D035J	Financial Inventory Accounting & Billing System
D035K	Wholesale & Retail Shipping and Receiving
D002A	Standard Base Supply System
IAPS	Integrated Accounts Payable System
POSY	Purchase Order System
G072A	Depot Maintenance Production Cost System
G072D	Contract Depot Maintenance Production Cost System
G017	Depot Maintenance Equipment Program System
G037G	Maintenance Labor Distribution & Cost System

The legacy systems are almost all old (circa 1970s technology), mainframe-based systems. In anticipation of DMMIS, the Air Force ceased updating those systems approximately five years ago. Although they form a financial system, the interfaces between the individual legacy systems require significant manual intervention and do not work as a single entry system.

Individual data systems have received FMFIA reviews and audit checks. However, the suite of systems has not been validated as an accounting system. Furthermore, the suite was not graded against the DFAS functional requirements document.

Two of the legacy financial systems (H069G and POSY) run on a personal computer; the others run on mainframe computers operated by DISA. DISA charges for running these systems cannot be derived from the data DISA made available because those data do not have costs by system; only aggregate costs per ALC are available.

Depot Maintenance Management Information System

DEVELOPMENT HISTORY

DMMIS began in 1985 as a demonstration project at Ogden ALC. The purpose of the project was to demonstrate the application of Manufacturing Resource Planning, known as MRP II, to depot maintenance. MRP II is a closed-loop planning and control system designed to coordinate capacity planning, production scheduling, shop floor control, job control, and material ordering and control.

On the basis of a positive assessment of the potential benefits from MRP II, the Air Force embarked on a program to develop DMMIS for application at all of its depots. In late 1986, the Air Force released its request for proposals (RFP) for an MRP II system. The original RFP included financial and accounting requirements. Upon receipt of the bids from industry, the Air Force decided that the costs were too high and chose to eliminate the financial and accounting requirements. By 1990, the Air Force reconsidered and decided that those requirements should be included in DMMIS. The contractor began development of the financial portion of DMMIS in 1991. In 1993, DMMIS began to operate at Ogden ALC as a prototype, which is commonly referred to as beta testing. Over the next three years, several versions of DMMIS have been successively deployed to Ogden ALC.

DMMIS was chosen as the DoD's Corporate Information Management (CIM) standard system for depot maintenance in 1993. The Joint Logistics Systems Center (JLSC) incorporated DMMIS into its plan for the Depot Maintenance Standard System (DMSS). DMSS was conceived as a suite of information systems that would provide the full range of information management needed to operate any military maintenance depot. Under the DMSS concept, DMMIS would be deployed to the maintenance depots of all Military Services. JLSC began providing funding for DMMIS development and, in March 1995, took formal control of the DMMIS program office. Later that spring, plans for DMMIS deployment were curtailed; DMMIS would be deployed just to the Air Force depots. That decision was based on the differences in depot business practices among the services and difficulties experienced with DMMIS in its prototype operation at Ogden ALC.

DMMIS is still in operational testing at Ogden ALC. Because of a large backlog of outstanding problem reports, deployment to the other ALCs is on hold. No revised dates for deployment and full operational capability were available at the time of this report.

DMMIS Overview

DMMIS is primarily an on-line, interactive, mainframe program based on MRP II concepts. It links functional areas within depots, including receiving, inspection, inventory control, shop floor control, quality controls, planning, scheduling, routing, data collection, data processing, finance, and forecasting. It consists of approximately two million lines of code and 14 subsystems. The subsystems associated with financial functions, which we refer to as DMMIS-F, are described later in this chapter. The set of subsystems that manages production is denoted DMMIS-P. Some of the subsystems operate in real time and others run in batch mode. The majority of the code is written in COBOL 74. That COBOL version and the operating system are both from the computer technology of the early 1980s and will soon lose vendor support, which will require conversion to a newer version.

Both the production and financial portions of DMMIS are based on commercial off-the-shelf (COTS) packages. The COTS MRP II package, Control Manufacturing, was developed in the late 1970s by CINCOM, Inc. That package had been developed for manufacturing new items, in which job routings and material requirements are known with certainty. In contrast, depot maintenance is based on the condition of the item: only the repairs and replacements needed to restore the item to operational status are performed. Hence, depot maintenance differs significantly from new manufacturing. Differences occur in managing the bills of material, routings through the work stations, repair and replacement factors, controlling the carcasses that come in for repair, scheduling, and funds approval. In addition, depot personnel identified other requirements for managing their workloads. The DMMIS program made major modifications to the COTS MRP II package to accommodate the depot maintenance requirements. As a result, less than one-fourth of the current DMMIS code is CINCOM software.

The DMMIS financial COTS package, Financial and Accounting Reporting System (FARS), has also been extensively modified. Partly, this is because of depot maintenance peculiarities and partly because the ALCs use a different accounting scheme than FARS. Less than one-fourth of the DMMIS financial code is from the original FARS package.

RESULTS AND STRUCTURE OF ANALYSIS

Assumptions

The original DFAS tasking for this economic analysis was based on three key assumptions: that DMMIS-F is a current Air Force accounting system for the DMBA; that DMMIS-F addresses all Air Force DMBA workload; and that significant costs for the study would include only the costs to upgrade DMMIS-F to satisfy the DFAS requirements, deploy DMMIS-F to three sites, and provide O&S. As demonstrated by the findings set out later in this chapter, *none of these assumptions is wholly correct.* We found the following:

- *DMMIS-F is still in development.* Although in use at Ogden ALC, it is not in full use and is not yet a stable system. The other ALCs continue to use the suite of legacy financial systems.

- DMMIS is being deployed for the *component workload only.* For engines, airframes, and "other" workload, DMMIS-F will receive inputs from legacy financial systems. Those legacy systems must be retained. Furthermore, as we discuss later, those systems require improvements and validation. One deficiency of the legacy systems is that they do not collect all the data necessary to support the DFAS functional requirements. The most serious shortfall is the lack of actual direct labor hours by job and work area. Therefore, supplemental systems will be required to collect those data from the workloads not managed by DMMIS.

- A complete economic analysis of providing DFAS functionality to the Air Force DMBA must include not only all the costs noted above, but, in addition, the *cost to complete DMMIS-F development* and the *cost to fix its problems.*

Keeping these findings in mind, we first estimate the cost of the DMMIS-F upgrades and deployments as if the original assumptions were true. We then note the additional costs that will be required to implement a working accounting system for all Air Force DMBA workload.

DMMIS-F Costs

COST SUMMARY

Table 5-2 summarizes the costs of providing the Air Force DMBA with accounting functionality that meets the DFAS requirements. The costs are based on using the financial modules of DMMIS to the extent possible, upgrading those modules, fixing and using selected legacy financial systems, and developing and operating supplemental systems.

Table 5-2.
Cost Summary

Cost category	Estimate ($)
Investment	
Upgrade DMMIS-F	$5 million to $15 million
Deploy DMMIS-F	$1.5 million
Develop supplemental systems	$2 million to $3 million
Fix and validate retained legacy systems	**Unknown**
Fix DMMIS	**Unknown**
Annual Operations and Support	
System maintenance	
DMMIS-F	$2 million
Supplemental systems	$0.4 million
Retained legacy systems	Unchanged
Accounting	Unchanged
Computer support	**Unknown but higher**

INVESTMENT COSTS

The cost to upgrade DMMIS-F to meet the DFAS functional requirements ranges from $5 million to $15 million. Total deployment costs from FY96 onward are estimated at $1.5 million. That amount already has been expended through FY95. Supplemental systems to collect actual direct labor at the shop floor [by job and resource control center (RCC)] and feed those data to the DMMIS-F general ledger may cost $2 million to $3 million for the non-DMMIS workload. The costs of fixing and validating the remaining legacy systems and fixing DMMIS are unknown but could well be substantial.

ANNUAL OPERATIONS AND SUPPORT

CDA operations and support (O&S) costs for DMMIS-F and the supplemental systems are estimated to be $2.4 million per year. The DISA charges are unknown, but are expected to be much larger than today's for two reasons: most of the legacy systems must be retained and

DMMIS-F uses much more data and has many more transactions than the legacy systems.

BENEFIT

The only direct economic benefit of DMMIS-F is avoiding the O&S costs for the few legacy financial systems that can be shut down when DMMIS is fully operational for the component workloads. The associated CDA effort costs about $0.6 million per year.

DMMIS-F DESCRIPTION AND FINDINGS

DMMIS-F Subsystems

Figure 5-1 depicts the 14 subsystems of DMMIS. Three of those subsystems, collectively referred to as DMMIS-Financials (DMMIS-F), are used to perform financial functions related to the DFAS functional requirements. Four additional subsystems are required to operate the financial subsystems. One of those, Time and Attendance System (TAS), is a financial subsystem, but we exclude it from DMMIS-F because of the DFAS limits on the scope of this study. The remaining seven subsystems are used only for production planning and management functions.

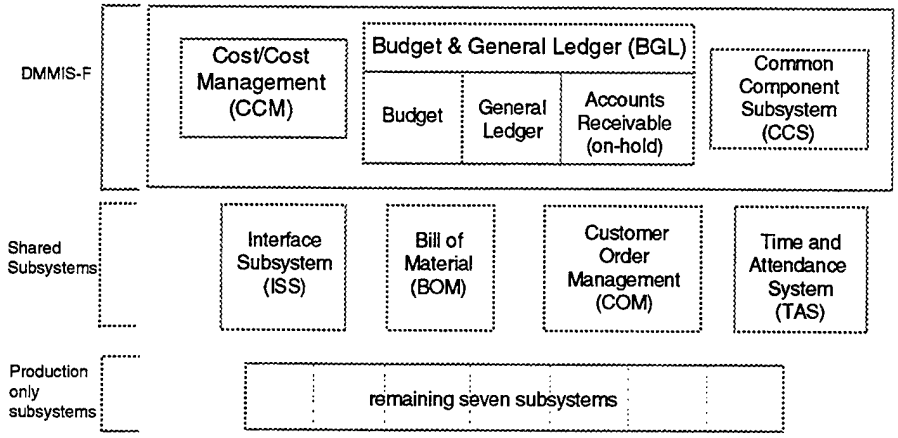


Figure 5-1.
DMMIS Subsystems

The DMMIS-F subsystems are Cost/Cost Management (CCM), Budget and General Ledger (BGL), and Customer Order Management (COM).

CCM runs in near real-time at the shop-floor level. It collects data on the actual labor and material usage for each operation. CCM uses the actual resource data and the current work standards to compute "operational" variances that are passed to the general ledger as batch updates. CCM

calculates cost and overhead rates and end-item sales prices, tracks inventory quantity and value, and computes variances between estimated and actual costs. Data bases in CCM provide cost management data for use on the shop floor.

BGL contains the general ledger and budget modules. Eventually, it will contain accounts receivable features to support billing and generate customer invoices for both DMMIS and non-DMMIS jobs. Development of accounts receivable is on hold while the program office works on fixing DMMIS problems. For production jobs managed by DMMIS, BGL receives labor and material cost data from CCM. For non-DMMIS production jobs, those data are rreceived from legacy financial systems via the Interface Subsystem (ISS).

COM handles the entry and maintenance of project order funding. When a job is established, the associated funds are obligated from COM.

DMMIS-F Functional Coverage

The original design goals and specifications of the DMMIS-F covered much but not all of the accounting functionality required by DFAS. Full coverage was to be achieved by upgrading DMMIS-F and linking DMMIS-F with legacy financial systems. The cost of the DMMIS-F upgrade is discussed in the next section. Table 5-3 lists the legacy systems that will be needed to work with DMMIS-F.

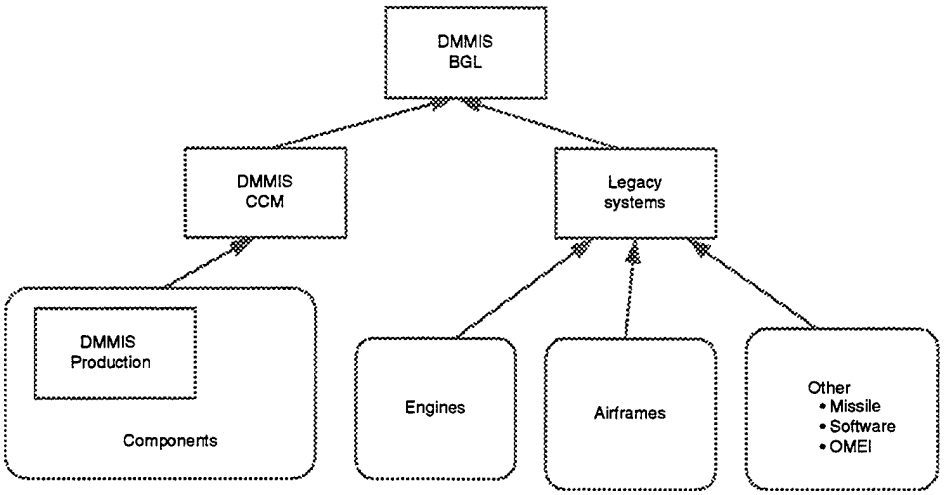
Table 5-3.
DMMIS-F Functional Coverage

DFAS requirements groups	DMMIS	Legacy systems
Fund distribution	COM, A/R	G004B
General ledger	G/L	-
Fixed assets	-	G017
Cost	CCM	G004L ,G072A, G072D,G004H,G037G
Accounts payable	-	IAPS
Accounts receivable	A/R	-
Billing	-	POSY
Inventory	-	D035J,D035K,D002A

DMMIS Workload Coverage

The original tasking for this study assumed that DMMIS would apply to the total depot workload. We found that the production portion of DMMIS and DMMIS-F cover different workloads. This finding has profound implications for the cost of providing the functional capabilities required by DFAS for the Air Force DMBA. In this section, we describe the workload coverage and its implications for accounting functionality.

Currently, DMMIS-P will cover only the organic component workload at each ALC. A DMMIS solution for the organic engine workload is being considered in the DMMIS long-range plan but is still unfunded, and a milestone for starting a DMMIS solution for the organic airframe workload has not been established. Without a total DMMIS solution for all organic workloads, the organic repair workload will have to be managed by a combination of DMMIS and legacy production and financial systems as shown in Figure 5-2.



Note: OMEI = other major end items.

Figure 5-2.
DMMIS Workload Coverage

With the DMMIS implementation approach described above, DMMIS-P and DMMIS-F will cover different workloads. DMMIS-P will apply only to the component workload, which is about 50 percent of the workload, in terms of dollar value. For the DMMIS-P workload, the Cost/Cost Management subsystem gathers the detailed cost data on individual production operations and passes the results to the BGL subsystem.

DMMIS-F, on the other hand, is being designed so that the BGL subsystem will accommodate both the component workload managed by DMMIS-P and the engine, airframe, and other workloads managed with the legacy production and financial systems. Although workload and financial data from both DMMIS and the legacy systems will be in the BGL, the data passed to the BGL through the legacy systems are different from the data passed through the CCM subsystem. For example, the direct labor hours and costs are collected and reported (according to the DFAS accounting criteria) for each job order number (JON) and resource control center (RCC) served by the CCM subsystem. However, the direct labor hours and cost for each JON and RCC that are passed to the BGL from the legacy systems are not the same and do not meet the DFAS accounting criteria; those labor hours and costs are collected and reported for each RCC and then *allocated* to the individual JONs on which each RCC worked. The allocation is based on the standard engineering hours for the completed production operations. Total worker time, including non-productive time (i.e., indirect hours), is allocated.

The significance of this data-feed issue is that when DMMIS-F was evaluated by DFAS, only the workload under DMMIS-P that fed into DMMIS-F was evaluated. The score of the "current" system was thus based only on the portion of the organic workload running under DMMIS-P and passing data to BGL through CCM. The capability of DMMIS-F to report on the organic workload feeding into BGL through legacy systems was not evaluated.

This issue was not considered a problem by the grading team because it was assumed that DMMIS-P would soon be running all the workload at all depots. However, it is now evident that DMMIS-P will not run all the organic workload at the ALCs. There are three significant consequences of not implementing DMMIS-P for all workloads:

- The legacy production and financial systems must be retained, and thus, any anticipated benefits and reduced operating costs that would have resulted from eliminating those systems will not be realized.

- Those legacy systems have not been maintained or updated for at least the last five years while DMMIS was being developed. Thus, the Air Force should anticipate that a significant effort will be required to "reestablish" the legacy systems and to implement changes to them needed for compliance with the CFO Act, FMFIA, and DFAS regulations and accounting criteria. Furthermore, the entire legacy financial system needs to be validated as a financial system.

- Supplemental information systems will be required to augment the legacy systems to satisfy DFAS accounting criteria for collecting and reporting direct labor hours and costs.

DMMIS Accounting Schema

DMMIS is designed to be a "standard" cost management system where performance is measured and reported against engineered standards. Figure 5-3 shows how this standard cost system is implemented by DMMIS.

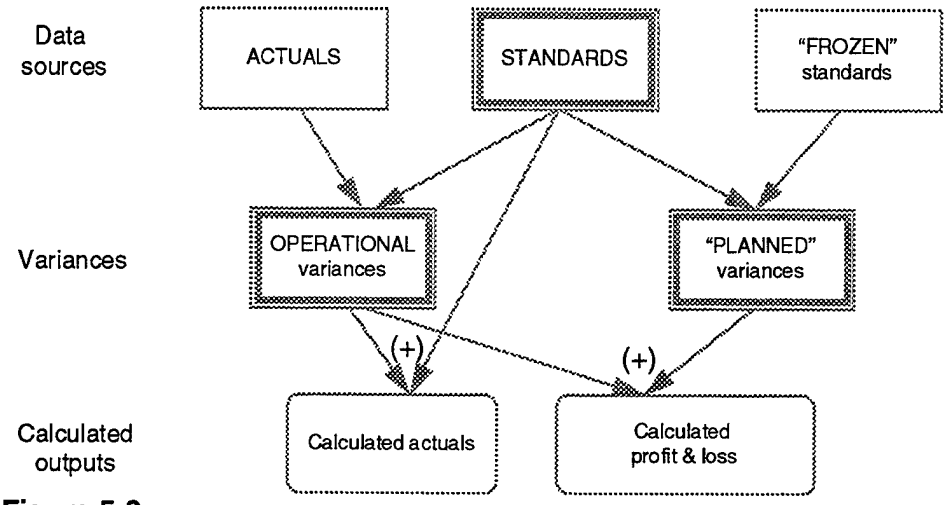


Figure 5-3.
DMMIS Accounting Schema

The DMMIS accounting schema has three sets of data sources and two sets of calculated variances. The three data sources are (1) actual labor hours and material usage and costs that are captured and reported in the CCM subsystem; (2) the engineered labor, material, and overhead standards for each production operation (i.e., what each production operation is expected to require); and (3) the "frozen" standards that are based on the standards used to establish the end-item sales prices charged by the depot. The frozen standards are established two years before taking effect.

The CCM subsystem of DMMIS compares the actuals with the engineered and frozen standards and calculates two types of variances: operational and planned. Operational variances are the differences between actuals and the engineered standards (i.e., what resources were consumed versus what resources were expected to have been consumed). The so-called planned variances are the differences between the engineered standards and the frozen standards. Altogether, CCM calculates 14 different variances.

Those variances plus the engineered standards, as shown in the highlighted boxes in Figure 5-3, are the only data from the CCM that are posted to, and retained by, the DMMIS BGL subsystem. Actuals are not passed from the CCM to the BGL. When the financial reports are prepared from the BGL trial balance data, *the "actual cost" of the depot operations and its profit and loss for the accounting period must be calculated from the engineered standards and the 14 variances.*

Because the DMMIS-F general ledger does not retain the basic financial accounting information on what was actually spent in the depot, each of those 14 calculated variances must be correct (both logically and computationally) to have an auditable picture of what has been spent by the depot and its profitability. If the calculated variances are incorrect, the accounting schema used by DMMIS-F will report incorrect actuals and incorrect profits and losses.

The DMMIS-F computations had been subjected to a verification and validation process as part of the original deployment to Ogden ALC almost three years ago. In addition, the financial computations have been in use for the DMMIS workload at Ogden ALC since that deployment.

In November 1995, we discovered that the variance equations contained several serious errors. That discovery was an accidental result of a meeting at JLSC that had been called to address problems with the posting of data from CCM to the general ledger. As part of that meeting, the DMMIS contractor described the current design and workings of CCM and the BGL, including the formulas for the variance equations. LMI reviewed the equations and found numerous flaws, including

- incorrect units for the lot size variance (dollars per hour rather than dollars);
- incorrect treatment of the variance caused by including a different number of items for a job setup than the number used in the EISP computation;
- incorrect signs in several equations; and
- two of the three labor variance equations accounted for all possible variance.

In mid-December, the DMMIS contractor provided revised variance equations. LMI reviewed the labor equations. We found that the revised equations had corrected several of the errors, but they still contained problems in the job setup variances. The revised equations will yield the correct variance between frozen costs and actual costs for closed jobs.

However, they provide incomplete variances for open jobs, which means that monthly profit and loss statements will be in error. Furthermore, the shop floor cost analysts will not be able to fully and correctly analyze the reasons for variance in labor setup costs.

LMI has not reviewed either the revised variance equations for material and overhead or the associated computer code. Concerns remain about who will be responsible for validating the equations and their implementation. The complexity of the equations and history of the program indicate that the variance equations are an area of high risk.

Incorporating this accounting schema is a major departure from the original COTS accounting package and may account for many of the modifications made to that COTS package as it evolved into the current DMMIS financial system.

DMMIS-F Deployment

OGDEN ALC DEVELOPMENT

Ogden ALC was the original demonstration site for the program that became DMMIS. In 1993, Version 1.0 of DMMIS was deployed to Ogden ALC as a beta test site. The DMMIS Budget and General Ledger (BGL) subsystem was applied to the total depot workload. However, only a small portion of the workload (primarily the C-5 landing gear shop, representing about 6% of the total) was placed under DMMIS-P control. The amount of workload under DMMIS-P is still small. Hence, only a small portion of the workload is reported through the CCM subsystem. Financial data for the vast majority of the Ogden ALC workload is fed to the BGL by the legacy financial systems.

The deployment of DMMIS to Ogden ALC has experience many serious problems. Among them are very long run times for updating data in the BGL subsystem (even though only a small part of the workload is under DMMIS-P) and major problems with "fixes." Three examples of the latter condition are: one new version of the BGL did not work (which forced temporary return to manual accounting); some problems that were "fixed" recurred; and new problems appeared after other problems were fixed. The problems have persisted, and at one point, Ogden ALC seriously considered reactivating the old general ledger program.

WARNER-ROBINS ALC DEPLOYMENT

Warner Robins Air Logistics Center (WR-ALC) was scheduled to be the first Air Force base to implement the Operational DMMIS financial (DMMIS-F) system. (Ogden ALC is the beta test site for DMMIS-F.)

WR-ALC's implementation plan called for parallel processing the same input data in both the DMMIS-F and the legacy financial systems during the last quarter of FY95 (i.e., July, August, and September 1995) and then shutting down the legacies and relying entirely on DMMIS-F in FY96 (i.e., starting October 1, 1995) for depot maintenance accounting and financial reporting. In anticipation of completing the DMMIS-F implementation by October 1, WR-ALC established an implementation team, trained 80 personnel in DMMIS-F, prepared the many data tables needed by DMMIS-F, and began collecting and loading the FY95 test data.

LMI visited WR-ALC in November 1995 and found that DMMIS-F implementation was significantly behind schedule. The WR-ALC implementation team encountered many unexpected problems running the software, loading the data, and verifying the accuracy of the DMMIS-F outputs. As a result of those problems, the WR-ALC implementation team had not yet finished processing the July 1995 data.

For example, during our visit, LMI was informed about the following:

- Problems that were fixed in previous software releases frequently reoccur in subsequent software releases. Thus, when WR-ALC receives a revised set of software, the implementation team must restart the validation process from the beginning, instead of restarting the validation effort from where it was stopped, to ensure that the new software will work.

- WR-ALC has experienced many problems with the "budget explode" programs. Budget explode programs prepare the detailed rates and end-item sales rates for the forthcoming budget preparation cycle. By December 1995, WR-ALC had submitted four discrepancy reports on budget explode software and, despite ensuing fixes, those programs still did not work correctly. Currently, the planned labor application (PLA) rates are being calculated improperly.

- WR-ALC's July 1995 general ledger trial balance that was prepared using DMMIS-F is out of balance by more than $65 million. In the Air Force accounting system, the trial balance is a major, month-end

report that DFAS uses to prepare the DMBA financial reports.[1] The accounting system should not allow an out-of-balance condition to be accepted, because such a condition may indicate that an extremely serious accounting system error has occurred. As of December 1995, the cause of the out-of-balance problem is still unknown. To facilitate the DMMIS-F implementation schedule, the problem was resolved by manually entering the data base access to alter the DMMIS general ledger entries to agree with the H069G (the legacy general ledger), hoping the out-of-balance condition was caused by some nonrecurring problem exogenous to the DMMIS-F software. At the time of our visit, WR-ALC had not yet begun processing the August data; therefore, they do not know if there is still a problem with the general ledger.

- WR-ALC and Ogden-ALC cannot validate the so-called actual rates calculated by DMMIS-F for resource control centers (RCCs). DMMIS-F uses the actual rates for allocating the monthly actual non-direct costs of an RCC to each JON for analyzing the variances between standards and actuals at the RCC level, and later for calculating actuals (See the discussion on DMMIS-F accounting schema). However, those rates are not being calculated properly. (There also appears to be confusion within DMMIS-F about what is an "actual rate." WR-ALC personnel provided LMI with a report from the DMMIS BGL subsystem clearly indicating that actual rates are the actual monthly costs of an RCC divided by the *earned* hours (i.e., the number of standard hours for each production operation completed by that RCC). However, within the DMMIS CCM subsystem, the term actual rate refers to the actual monthly costs of an RCC divided by *actual* direct labor hours worked in that RCC.)

- The requirements for excessive deficiency report (DR) documentation are delaying getting the problems solved. WR-ALC personnel must thoroughly document in a DR not just a problem's observed effects but also the cause of a problem before the program office will process

[1] A trial balance separately sums all the debit transactions and all the credit transactions during the accounting period. In double-entry accounting, each transaction generates a debit and a corresponding credit for the same amount (i.e., one entry is posted to an asset account the other to a liability account); therefore, if the transactions have been posted properly, the sum of all debits will equal the sum of all credits. When they are not equal, some posting error must have been made and the accounting records are considered to be out of balance. *Equality of debits and credits on the trial balance does not ensure that the amounts posted are correct; equality only indicates that the transactions have been posted properly following the debit and credit principle (e.g., the wrong accounts could have been posted or transactions could have been omitted and the trial balance would still be in balance).*

a DR and begin corrective action. However, the DMMIS-F documentation provided to WR-ALC lacks sufficient detail to determine either what specific algorithms or what cost data are being used in DMMIS-F calculations. We were informed that members of WR-ALC's implementation team routinely must contact (or visit) the DMMIS program office in Dayton to locate the information needed to simply document DMMIS-F problems.

- WR-ALC has coded several of its DRs as a Priority 1, which signifies a high-priority problem resulting in a work stoppage. The program office has reassessed those priority DRs and reclassified them to something lower if the user can continue processing with incorrect data.

Currently, the Air Force has suspended the implementation of DMMIS-F throughout the Air Force. This suspension is a recognition of the serious problems DMMIS is having. Resumption of DMMIS-F implementation at WR-ALC had not been scheduled as of January 1996.

Oklahoma City ALC Deployment

Oklahoma City Air Logistics Center (OC-ALC) was scheduled to implement DMMIS-F in October 1996. Detailed planning, training, and table-building has not yet begun. The Air Force made the decision to suspend DMMIS-F implementation. Implementation of DMMIS-F at OC-ALC had not been rescheduled as of January 1996.

Analysis of Major Cost Elements

In the first section, we summarized the investment costs, O&S costs, and benefits associated with using DMMIS as the core element of the Air Force DMBA accounting functionality. This section provides more detailed discussion of the major cost elements.

Upgrade DMMIS-F

First, we discuss the investment cost to upgrade DMMIS-F to satisfy the deficiencies identified in the Graded Functional Requirements Document. [4] This discussion assumes that DMMIS is working properly and provides the functions that were presumed to be present when the grading was performed. The cost to bring DMMIS to that state is discussed in a later section.

The *Graded Functional Requirements Document*, as amended by DFAS and the Services, identified 116 deficiencies in DMMIS-F. Table 5-4 shows the

numbers of deficiencies by major functional area. The extent of the deficiencies varies widely. For some functions, DMMIS-F requires only minor modification to satisfy the DFAS requirement. An example of that is the need merely to activate a feature that is not currently used. For instance, as earnings are generated, they could be used in DMMIS-F to automatically reduce unearned revenues. The *Graded Functional Requirements Document* requires that DMBA accounting systems have and use such a capability. Instead, that process is being done manually in DMBA activities by using information gathered from another system that calculates incremental revenue.

Table 5-4.
Number of Functional Deficiencies in DMMIS-F

Accounting category	Functional deficiencies
Funds distribution	17
General ledger	10
Fixed assets	12
Cost	10
Payables	17
Receivables	30
Billing	13
Inventory accountability	5
General system features	2
Total	116

Some of the DFAS requirements, such as those related to accounts payable, are outside the original design requirements for DMMIS-F. For those functions, DMMIS-F will need entire new programs, or at a minimum, as in the case of achieving any accounts payable capability, an interface would need to be created between the IAPS and DMMIS-F.

To be consistent with the estimating technologies used in this study for SIFS and NIFMS, we would have used historical data on DMMIS software development costs to calibrate the SLIM software cost model, and then we would have applied that model to estimates of the amount of software (new and modified) required for the upgrade. Unfortunately, the DMMIS program office could not produce the necessary data. We encountered the following data limitations:

- Records of the cost to develop individual subsystems or program modules are not kept.
- The contractor's work packages are in engineering change proposals (ECPs) that combine several kinds of work, such as new code for

different areas of DMMIS, modifications and fixes to existing code, and training.

- Accurate counts of the lines of code in the DMMIS subsystems by version were not available. A table of lines of code for seven releases was identified, but we discovered that counts for only two or three of the releases were actuals; the others were interpolated or estimated counts.

- The program office does not use any software cost model to check or review the development cost estimates that it receives from the contractor.

A further complication is that the financial code may have a different development cost than production code because the financial programmers were primarily from an accounting firm acting as a subcontractor rather than from the prime contractor.

The program office did not feel that it could generate estimates of the amount of code that would be needed for the upgrades or its costs. The contractor was willing to develop a cost estimate for the total upgrade (for a price), but was not willing to provide a supporting rationale. Without that rationale, we would be unable to provide an independent judgement of the validity of the contractor's estimate.

Given those data limitations, we explored alternatives for generating an estimate of the upgrade cost. We identified two previous estimates, which we hoped would provide estimates of the amount of software development work that would be required. With the assistance of the program office, we identified a limited data set for calibrating the SLIM software cost model.

Previous Upgrade Cost Estimates

We identified two estimates of the cost to upgrade DMMIS-F, one by an ex-member of the program office and the other by DFAS–Denver (DFAS-DE). Both estimates were generated as quick-response efforts. They used different procedures and assumptions.

Air Force Materiel Command Estimate

The first estimate was developed by a financial analyst in the AFMC DMMIS program office. He organized the deficiencies into groups. Some deficiencies were omitted because AFMC disagreed with DFAS on the validity of certain requirements. Most of those instances related to funds distribution. Several others were omitted because they were covered by funded engineering change orders. For each group, the analyst used his knowledge of the DMMIS architecture and current functions to estimate the

numbers of new or modified programs and interfaces with existing data systems that would be needed. The totals were 29 programs and 12 interfaces. He applied factors for the numbers of government and contractor labor hours per program and per interface. Those rate factors were estimates based on conversations with DMMIS engineering staff; they did not result from analysis of DMMIS historical data. He increased the estimate by 50 percent to account for uncertainty in software development. The upgrade effort was estimated to require 25,760 labor hours.

How valid is the AFMC estimate? In our judgment, the estimate is low. The estimated number of programs and interfaces appears reasonable given the estimator's knowledge of the DMMIS design. Some increase in the counts is required for the requirements that were omitted by AFMC and are still considered valid by DFAS. In addition, the factors for the numbers of labor hours per program (360) and interface (720) seem low in light of the overall history of DMMIS development. As we discuss later, the apparent productivity for DMMIS code is quite low compared to industry standards.

DFAS Estimate

DFAS-DE generated an estimate of $24 million to upgrade DMMIS. Limited supporting rationale for the estimate was available. However, we understand that the DFAS-DE estimate included the cost to embed the financial functionality from many legacy systems into DMMIS, which accounts for almost $20 million of the total. The estimated cost to incorporate only the changes necessary to satisfy the deficiencies is $4 million to $4.5 million.

The previous cost estimates for DMMIS upgrades were developed to rapidly respond to management questions. They used rough approximation rules. Based on our review of the associated procedures and rationale, we find the estimates to be inadequate for the current study.

APPLICATION OF A SOFTWARE COST MODEL

We selected the SLIM model for estimating the software development costs of the DMBA accounting systems. SLIM (or any other software cost model) must be calibrated to each particular development environment. Calibration is performed with historical data. In a typical SLIM application, historical data on the cost, size (e.g., executable lines of source code), schedule, and staffing profiles are used to calibrate a "productivity index." That index then is used to analyze the resources required for new software development. SLIM uses a large data base of industry experience to assist with calibration and analysis.

The DMMIS program office identified three data points that we could use as historical data with SLIM. Those points were ECPs that were dedicated

primarily to development of financial software. For each ECP, we received the program office estimate of the lines of code developed and the dollars expended.

We did not have schedules and staffing profiles for those ECPs. General results from the SLIM model, which are based on a large set of data, show that software development cost is sensitive to both schedules and staffing profiles. As the schedule is shortened, cost rises dramatically. Once the number of personnel reaches a certain level, adding more people causes large, nonlinear cost increases. To develop a "best case" estimate for the DMMIS upgrade cost, we assumed the existence of nonconstraining staffing profiles and did not constrain the development schedule.

When we calibrated SLIM for DMMIS, we found a productivity index of 12.1. Compared to the 2,500 business application data points in the SLIM database, that value represents very low productivity.

To apply SLIM to the DMMIS-F upgrades, we needed an estimate of the number of executable lines of source code to be developed. We used the AFMC estimate of the number of programs and a range of lines of code per program to estimate a range of possible values. Then we ran SLIM with those values. We performed sensitivity analysis on the staffing profiles, schedules, and productivity index. Overall, we estimate that the cost to upgrade DMMIS-F to satisfy the deficiencies could range from $5 million to $15 million, assuming that outstanding problems in DMMIS are fixed first. (The data used for the analysis and sample SLIM results are in Appendix F.)

Deploy DMMIS-F

Estimates of the labor required to deploy DMMIS were provided in the *Cost Analysis Requirements Description (CARD).* [10] Those estimates assumed that DMMIS is a working system. Deployment consists of three major activities: training the depot users of DMMIS-F, loading financial data tables, and CDA support. The estimates from the CARD were supported by discussions with personnel involved in DMMIS-F deployment at Ogden and Warner-Robins ALCs.

We applied representative government and contractor labor rates to the DMMIS deployment labor estimate. This produced an estimate of $10 million. Based on several estimates from the DMMIS program office of the fraction of DMMIS that is attributable to the financial subsystem, we estimated that 30 percent of the effort was for the deployment of DMMIS-F. Total deployment cost would then be approximately $3 million, of which $1.5 million will be required from FY96 onward.

Because DMMIS deployment is frequently interrupted by problems and attempted fixes, both Ogden and Warner Robins ALCs are experiencing higher costs than planned to deploy DMMIS. This trend is expected to continue. Consistent with the initial assumption that DMMIS-F is a functioning system, we are using the estimate of $3 million. Increases as a result of problems and fixes are considered to be a part of the cost to get DMMIS-F operating properly.

Develop and Deploy Supplemental Systems

Financial information will continue to be provided by the legacy financial systems for workloads like missiles and other major end items (OMEI) as well as workloads performed by the aircraft division (primarily aircraft overhauls and modifications) and by the engine division (primarily jet engine overhauls and modifications). In addition to fixing the legacy financial systems that must be retained because of the above mentioned non-DMMIS-P workloads, supplemental accounting systems will be needed to provide information not now available in the legacy systems but required to meet DFAS accounting guidelines.

DFAS requires a cost accounting system that captures and collects the direct labor hours actually consumed for each job order number (JON). The legacy financial system does not collect actual direct labor hour data for individual JONs. Unless a DMMIS-P solution were fully deployed to all workloads, a supplemental information system will be required to capture and collect the actual direct labor hour data by JON for all non-DMMIS-P workloads.

Such a supplemental system must perform two major functions: It must identify and collect the direct labor hours actually worked on each JON and it must feed that data to the DMMIS-F general ledger. This subsection summarizes how we prepared our estimate of the cost for developing and deploying such a system. (Appendix F documents the cost estimates.)

Collect Operational-Level Data for Engines and Airframes

To satisfy the DFAS accounting requirements, data on the actual direct labor hours by task and work center must be available. Those data are collected by DMMIS, but not by the legacy systems. For the workloads not managed by DMMIS-F, supplemental systems are needed to collect the actual direct labor hours at the shop floor level and to feed those data to the DMMIS general ledger.

LMI found that aircraft and engine workloads in the depots already have developed production management systems to assist managers in

managing their workloads. While those systems are not MRPII oriented, production managers indicated that the Programmed Depot Maintenance Scheduling System (PDMSS) for the aircraft workloads and the Item Tracking System (ITS) for the engine workloads provide them with significantly improved tools for managing the flow of work on the shop floor. Both PDMSS and ITS track workload as it flows through the repair process. Some depots are using PDMSS and ITS to capture the production data on completed production operations by JON and then to input that data into the legacy G004L system.

Because both the PDMSS and ITS track the work performed on each JON by having the technician enter into a computer the time when the production operation begins and when it ends, both systems have the potential for capturing the actual direct labor hours worked on each JON. PDMSS is being modified at one ALC to capture and track actual direct labor hours by JON. To collect actual direct labor hours by JON for all other non-DMMIS-P workloads will require similar modifications to the PDMSS at the other depots and to the ITS system. Our estimate for making such modifications is based on the OC-ALC experience of modifying the PDMSS to track actual direct labor hours for each JON.

The nonrecurring cost of developing and deploying a supplemental information system to collect and report direct labor hour and cost for non-DMMIS-F workloads is likely to be from $2 million to $3 million, depending on the assumptions regarding how much workload from SA-ALC and SM-ALC will migrate to the remaining organic repair depots. The recurring annual support cost will be about $0.4 million.

Fix and Validate Retained Legacy Systems

Of the data systems comprising the legacy financial systems, described earlier in the AF DMBA Baseline Accounting System section, only the G035A and the PC-based general ledger H069G systems will be replaced by DMMIS-F. For the foreseeable future, all the other legacy systems will be retained by the Air Force to support non-DMMIS-P workloads. In the preceding section, LMI discussed the resources for a supplemental information system that will be needed to provide information on non-DMMIS-P workloads that the current legacy financial system cannot provide. In addition to those resources, we also anticipate that the Air Force and DFAS will need to commit substantial resources for fixing and validating the financial information already provided by the legacy system. LMI did not quantify the magnitude of those resources as part of this tasking. The following is a qualitative assessment of why those additional resources will be needed.

Backlog of Deferred Fixes

While DMMIS was being developed, the Air Force operated under the assumption that DMMIS-F would replace the legacy financial systems. Consequently, for at least the past five years, the Air Force has shifted resources to the DMMIS development effort that would have normally been used to maintain and update the legacy systems. Interviews with the system managers for several of the key legacy financial systems indicate that a backlog of changes and modifications to those data systems now exists. In addition, the systems may contain unknown problems. For example, Warner-Robins ALC has compared DMMIS-F general ledger results with legacy system results. Some of the discrepancies were explained by previously unknown problems in the legacy system computations.

More Strenuous Regulatory Requirements and Management Emphasis

In addition to the backlog of changes, LMI anticipates other changes will be necessary as the legacy systems are now scrutinized more closely by DFAS. The retained legacy systems were not graded using the accounting criteria that DFAS used to evaluate DMMIS-F. LMI could not find any evidence that the suite of legacy financial systems were ever validated in their entirety as a financial accounting system. Our interviews with financial personnel in the Air Force together with the many audit reports prepared by the General Accounting Office (GAO) and the Air Force Audit Agency, indicate a pervasive distrust of the financial data being reported by the legacy financial system.

Fix DMMIS-F

The estimate of the cost to upgrade DMMIS-F to satisfy the DFAS requirements assumed that DMMIS-F was working properly; that is, it assumed DMMIS-F correctly executed the functions that were attributed to it during the functional grading. In the course of this study, we learned of many significant problems with DMMIS-F. A major meeting to address problems with DMMIS-F was held at the program office in November 1995. LMI staff attended that meeting. Significant areas of discussion included the following:

- DMMIS-F does not post the "frozen" standards from CCM to the BGL. This was the issue that was recognized during a recent training session and that provided the motivation for the meeting on DMMIS-F in November 1995. DMMIS-F uses earned values in several places where the frozen values should be used. The consequence of that error is incorrect summaries of profit and loss. The DMMIS contractor made a series of presentations to describe the current state of the CCM

and BGL subsystems, an interim solution, and a permanent solution to the posting problem.

- DMMIS-F does not correctly summarize the costs by JON and resource control center (RCC) (the basic profit center level of the depot). Under DMMIS-F, one RCC is responsible for inducting each job order into the system. That RCC may or may not perform work on the job order. Typically, several other RCCs will work on it. However, all costs are reported to the responsible RCC. As a result, while the overall total costs (and profit/loss statement) may be accurate, DMMIS-F cannot provide those costs by the RCCs that performed the work or by job order. Hence, the current incarnation of DMMIS-F fails to provide key management information that was supposed to result from the new depot management system. The DMMIS contractor proposed a solution for this problem that would provide the detailed reporting when a group of similar jobs are completed and the month-end financial results are tallied.

- DMMIS is apparently using incorrect material standard costs. Currently, DMMIS sale prices are based on the price of the material without the supply system's DBOF surcharge. However, the depot pays that surcharge when it purchases material from the supply system. Thus, the actual material cost to the depot is greater than the price that the depot is recovering from its customers. This problem appears to require changing the legacy system that is used as the source of material costs, which should be relatively straightforward to address. Of concern is the fact that neither the DMMIS reviews and tests nor the operational experience at OO-ALC identified this discrepancy.

- During the course of the meeting, LMI discovered that the variance equations were incorrect. As they were stated (and apparently have been operating at Ogden ALC), those equations are guaranteed to generate incorrect profit and loss statements and actual cost totals. The most worrisome aspect of the problem is that it was only recently discovered despite previous validation effort and several years of operation of DMMIS-F at Ogden ALC.

- DMMIS uses a table to represent the organizational structure of a depot. The associated program is called ORGU. It is used to roll up the costs. Because of limitations in the ORGU design and problems with its operation, the program office plans to invest several million dollars to revise the program.

As of January 1995, about 250 high-priority problem reports were outstanding. A large portion of those problems related to the financial parts of DMMIS. In response to the backlog, the program office has revised the DMMIS development schedule and priorities. The open problems will be fixed before completing development and installing operational versions. Thus, development of the accounts receivable module has been put on hold. It may not be restarted for at least 6 to 12 months. In addition, there are no revised dates for deployment of DMMIS-F to Oklahoma City ALC and Warner Robins ALC.

Annual Operations and Support Costs

O&S for DMMIS-F

The annual CDA cost for DMMIS-F can be estimated as a percentage of the anticipated total DMMIS CDA cost, which is $5 million according to the most recent budget plans. The program office estimated that about 40 percent of its sustaining effort could be attributed to DMMIS-F.

O&S for Supplemental Systems

The annual O&S cost for the supplemental systems is estimated to be about 15 percent of the development cost, which is about $0.4 million.

O&S for Retained Legacy Systems

Each legacy system has an office of primary responsibility (OPR) and a lead programmer. Because of the maturity of the systems (and the fact that upgrades and modifications are suspended), those tasks are part-time assignments. Based on discussions with the responsible offices at AFMC, ALCs, and DFAS, we estimate that the cost of providing Central Design Agency (CDA) support for the suite of legacy financial systems is less than $2 million per year.

The retained legacy systems should experience no significant change in their annual O&S costs after they are fixed and validated.

O&S for DFAS Services

We do not anticipate that DFAS accounting costs will change. There are no plans to increase or decrease the number of people at DFAS–Denver or

the DAOs as a result of deploying DMMIS. At the ALCs, the DAO personnel may be able to perform more analyses because DMMIS may automate some its manual work. DFAS billings to the Air Force will not change because the number of monthly trial balances will remain constant. However, because DFAS rates include DISA billings, they may increase eventually as discussed below.

DISA CHARGES

DISA charges are unknown, but can be expected to increase, perhaps by a large amount, for two reasons: First, DMMIS-F is computationally intensive compared to the legacy systems. To date, *the program office has not generated a credible estimate of the computer resources that will be required to operate DMMIS*. Combining DISA rates with extrapolations from the results of a JLSC preliminary study on DMMIS computer resource requirements yields an estimate of $8 million per year for DISA charges to DMMIS-F if it were deployed to three ALCs. Second, most of the legacy financial systems must be retained. Therefore, the cost of running DMMIS-F will be an addition to current DISA billings.

Benefits

One of the purported benefits of DMMIS was savings associated with shutting down numerous legacy systems. We found only three legacy systems with significant financial functionality that can be shut down when the currently-planned versions of DMMIS are fully developed and deployed.

Two of the legacy systems, G035A and H069G, have been shut down at Ogden ALC. They continue to run at the other ALCs. Their associated CDA efforts will continue until DMISS-F is deployed to all depots. When the DMMIS version for managing component workload is fully deployed to all depots, one additional legacy system (H117–Time and Attendance System) can be retired.

The annual CDA costs associated with those systems was not available from the Air Force. We did find that the office of primary responsibility and head programmer jobs are part-time assignments. Our estimate of the costs that will be avoided once those three systems have been retired is approximately $0.6 million dollars.

SUMMARY

The original tasking for this economic analysis was based on three key assumptions: (1) that DMMIS-F is a current Air Force accounting system for the DMBA; (2) that DMMIS-F covers all the depot workload; and (3) that the

costs would be limited to upgrading, deploying, and operating and supporting DMMIS-F.

All the assumptions were found to be false. The result is that the cost to provide the Air Force depots with accounting functionality that satisfies the DFAS requirements will be much greater than the cost to upgrade the DMMIS financials.

DMMIS is still in development. Operational testing began in 1993 at Ogden ALC. Currently, about six percent of Ogden's production workload is managed by DMMIS. The DMMIS-F general ledger processes financial data for all the workload. Because of problems with the software, dates have not been established for full deployment of DMMIS to the Air Force depots. Several significant problems remain in DMMIS-F. Development of the accounts receivable module has been put on hold for at least six-to-twelve months while the open-problem reports are addressed.

DMMIS does not cover all the depot workload. The primary focus of DMMIS has been the component workload, which represents about 50 percent of the total. Requirements for the engine workload have been developed. However, their implementation has not been funded or scheduled. No plans exist to add the workloads for airframes, missiles, software, and other major end items. For the workload not managed by DMMIS, *most of the Air Force's current suite of financial data systems will have to be retained.* Those legacy systems will feed the DMMIS-F budget and general ledger subsystem. Because the current systems do not collect actual direct labor hours by job and work area, supplemental systems will have to be added to collect that data and transmit it to DMMIS.

The total investment to provide the Air Force DMBA with accounting functionality based on DMMIS has the following components: Upgrade the DMMIS financials to satisfy the DFAS accounting requirements; deploy the DMMIS financials to the depots; develop and deploy the supplemental systems; fix and validate the retained legacy financial data systems; fix DMMIS financials to meet its original functional requirements. The sum of the first three elements is estimated to range from $9 million to $20 million. The latter two elements may be much more costly.

The legacy financial data systems are known to have many shortfalls with respect to the DFAS accounting requirements. Modifications to those systems were terminated about five years ago in anticipation of DMMIS. In addition, the legacy systems have not been validated as a suite. Recent testing at Warner-Robins ALC indicates that the suite may have serious problems. Fixing and validating the legacy financial systems could easily cost more than upgrading DMMIS.

The cost to fix DMMIS-F is unknown. DMMIS-F has major known problems, such as not posting the costs of resources consumed by the work center that performed the work. Some of the problems have been outstanding for several years. Perhaps even more worrisome is the fact that some problems are only now being discovered despite previous validation efforts and several years of operational testing. For example, in November 1995, we discovered that variance equations have serious errors. Those errors cause incorrect profit and loss statements and incorrect computation of actual costs. In addition, fixes to many problems have resulted in new problems.

We did not estimate the cost to fix the known problems. We cannot estimate the cost to fix unknown and future problems. Together, those costs could be overwhelming, and there is no assurance that the problems can be fixed in a reasonable time. Therefore, we recommend that options other than developing, fixing, upgrading, and deploying DMMIS-F be considered for the Air Force DMBA accounting system.

Chapter 6. Option Two: A Single System for all DoD DMBA

INTRODUCTION

Option Two is for one of the three Military Department accounting systems to be chosen for use in all the DMBA activities in DoD. Under this option, either the DMMIS financial subsystems (DMMIS-F), NIFMS, or SIFS would be deployed throughout its own Military Department and also would be exported to the other Military Departments, replacing each of their current systems. The chosen accounting system would have to interface with the production systems in all the depots.

When we examined this option early in the study, we noted that it was dependent on the key premise of early deployment of a single production system in all DoD maintenance depots. When we found that this premise was incorrect, we presented the argument given in this chapter. [11] As a result, the DBOF Corporate Board directed that no further consideration be given to Option Two. [12] Therefore, we did not construct final cost estimates for Option Two. Instead, resources were concentrated on estimates for Option One.

KEY PREMISE

The key premise that drove DoD staff to consider Option Two was that there would be a single set of production systems in all the maintenance depots in the near term. A single set of production systems in all of the maintenance depots would mean that the interfaces between that set of systems and a single accounting system would be identical for all maintenance depots in all Services. In other words, under Option Two, if interfaces were developed between the chosen accounting system and the standard set of production systems, in a Navy depot for example, those same interfaces would be applicable in an Army or Air Force depot.

This premise favors Option Two because one accounting system coupled with one set of production systems would mean only one set of interfaces would have to be developed instead of three. [In addition, it was assumed that under Option Two, only one accounting system would have to be upgraded to functional standards and only one central design activity (CDA) would be supported.]

We have found that this key premise no longer pertains. There will not be a single set of production systems in all of the depots in the near term. The

remainder of this chapter discusses this and other findings, describes the implications of these findings, and gives our conclusion on what they imply for Option Two.

FINDINGS

DMSS Deployment Schedule

The single set of production systems posited by the OSD staff was the Depot Maintenance Standard System (DMSS). It was to be deployed in all of the depot facilities by FY96. DMSS is a collection of several production systems as shown in Table 6-1. The shaded area highlights the systems with Manufacturing Resources Planning (MRP II) capabilities. (DMMIS-F is part of the larger DMMIS system shown in Table 6-1. DMMIS is primarily a production system.)

Table 6-1.
DMSS Near/mid-term Deployment Plans

	Original plan	Emerging plan			
DMSS Sub-Systems	All Services	Army	Air Force	Navy	Marine Corps
BAIM	X			X	
DMMIS	X		X		
COTS–MRP II*				X	X
SDS—MRP*		X			
PDMSS	X	X	X	X	X
Specialized support	X	X	X	X	X

Note: *indicates system not in original plan
BAIM = Baseline Advanced Industrial Management
PDMSS = Programmed Depot Maintenance Scheduling System.

As shown in Table 6-1, there are several important changes between the original plan for DMSS deployment and the current plan. The first change is that in the near- and mid-term (within the next six years) DMSS will not include the same systems at all the depots. In fact, there will be Service-unique systems—namely, DMMIS at the Air Force depots (and nowhere else) and BAIM at Navy depots (and nowhere else).

The second change is that DMMIS will not be the sole system for implementing MRP II functionality in the depots (shaded rows in Table 6-1). In the original plan, DMMIS was to provide that capability in all the Services. Instead, the MRP II capability may well be achieved using DMMIS at the Air Force depots, some COTS package at the Navy and Marine Corps depots, and SDS–MRP at the Army depots (although SDS-MRP is not a full-fledged MRP II system). Although details of the approach are not yet defined, one system for all Services

is not a near-term solution. Therefore, the key premise that there will be a single set of production systems in all the maintenance depots in the near term is no longer valid. Instead, there will be Service-unique sets of production systems, each presenting a different interface to an accounting system, each reflecting different business practices, and each having different schedules for implementation.

In the long term (2002 is one estimate), there may be a fully integrated version of DMSS. It will likely have reengineered applications, designed to work in a modern, client-server architecture, instead of the current set of applications. The implication is that if and when this occurs, it may be more reasonable to look at a reengineered accounting system that would fit into the modern, integrated DMSS architecture rather than an upgraded version of one of the current accounting systems.

Interfaces

Because there will not be a single set of depot maintenance production systems in the near- to mid-term, picking a single accounting system will entail the development of more, not fewer, interfaces than proceeding with Option One. In fact, two additional major sets of interfaces will need to be developed no matter which of the three accounting systems were chosen for Option Two. For example, if DMMIS-F were selected under Option Two, interfaces to the production systems in the naval aviation depots currently served by NIFMS would be required, and interfaces to the production systems in the Army depots currently served by SIFS would be required.

Under either option, interfaces would have to be developed for the naval shipyards, naval ordnance centers, MCLBs, and the Army arsenals. The difficulty of developing those interfaces may increase, however, if a system from another Service is chosen. This is because business practices and charts of accounts are more similar within a Service than across Services.

Upgrades

NIFMS will be upgraded to full functionality regardless of decisions on its use in the DMBA. This is because it will be used at Navy R&D activities. The upgrades for functionality will be made for the R&D community. This means they will be a "sunk" cost to the depot maintenance community with respect to the Option Two decision. Therefore, choosing SIFS or DMMIS as the standard system would not save as much as anticipated because the functional upgrades for NIFMS will take place regardless of which option is chosen for depot maintenance.

CDA Support

Because NIFMS will be used in the R&D community even if it were not used in the depot maintenance community, the CDA costs and other operating and support costs would remain. Therefore, the savings from eliminating the NIFMS CDA, if SIFS or DMMIS were chosen as a DoD standard, will not materialize. (Because the CDA would be smaller and supporting fewer sites, there might be some savings.)

At several installations, SIFS serves not only the depot but also the ordnance supply activities and the operation of the installation itself. This has a similar implication to that resulting from the R&D deployment of NIFMS – namely, if SIFS were not used by the depots it would still be needed to perform at least some of its other functions. Thus, most SIFS CDA costs would remain under Option Two.

DMMIS-F is part of the larger DMMIS system. There are three financial subsystems – the Budget and General Ledger (BGL) subsystem, the Cost /Cost Management (CCM) subsystem, and the Customer Order Management (COM) subsystem. There is debate about whether those subsystems could be separated from the production subsystems. Some claim that as a practical matter, the computer code is intertwined to such an extent that separation is not feasible; others say that separation is feasible. Also, the CCM subsystem produces information that management needs to take advantage of DMMIS capabilities. Therefore, it is not clear how much of the financial subsystem coding will continue to have to be supported by the CDA even if the BGL subsystem is replaced with SIFS or NIFMS. Again, much of the savings expected from eliminating CDA costs probably will not materialize.

Implications

The cost implications of our findings are summarized in the following subsections:

Investment Costs

In comparison to Option One, Option Two requires additional investment costs for developing interfaces and for deployments no matter which accounting system becomes the standard. These additional interfaces and deployments will be required for those sites using the two accounting systems not chosen as the standard accounting system under Option Two. (As discussed earlier, under either option, interfaces, enhancements, and deployments will have to be funded for sites now using systems other than SIFS, NIFMS, or DMMIS. Therefore, those costs are not additional costs, but rather costs that will have to be borne under either option.)

For example, if DMMIS were chosen under Option Two, the additional investment costs would be as follows:

- *Interface costs* are the costs of developing interfaces between DMMIS-F and the feeder systems (such as production, inventory, and time and attendance); reporting systems; and budgeting systems used in the NADEPS and in the Army Maintenance depots.

- *Enhancement costs* are the costs of making modification in the system to support unique business practices in the NADEPS and Army maintenance depots.

- *Deployment costs* are the costs of training and data conversion at the three NADEPS and four Army maintenance depots.

In contrast, certain investment costs under Option Two could be lower than under Option One because of the elimination of functional upgrade costs for the other two systems. For example, if SIFS were chosen, the costs of upgrading DMMIS would be saved. There are no savings, however, if those upgrade would be undertaken anyway, as is the case for NIFMS, which will be used in the R&D facilities.

(We believe that the increased investment costs for interfaces, enhancements, and deployments necessary for Option Two would be significant and would be much greater than the savings from not developing functional upgrades.)

Operating and Support (O&S) Costs

O&S costs for Option Two may be somewhat lower than O&S costs for Option One if fewer CDAs are fully maintained. However, CDA O&S savings are diminished to the extent that the CDAs for the systems not chosen to continue to operate and to the extent that supporting more sites and interfaces increases the costs of the chosen CDA.

For example, if DMMIS were chosen under Option Two, the CDA costs of NIFMS would decrease because that CDA would support fewer systems. The NIFMS CDA cost would not be eliminated, however, because the NIFMS CDA would still exist to support R&D activities. Similarly, the SIFS CDA would be diminished, but it still would have to exist to support other clients.

Conversely, the DMMIS CDA would have to support more sites and two additional sets of interfaces; thus, its costs would increase. In this example, it is not clear if there would be any net savings from CDA O&S costs.

Total Costs

Increased investment costs would have to be compared with any O&S savings to determine the total resource impact. Because, we believe, the additional

investment costs for Option Two would be significant and the savings of O&S costs marginal, Option Two would have greater costs than Option One.

BENEFITS

The benefit of achieving full functionality would most likely accrue sooner under Option One than under Option Two. This is because under Option Two, in addition to time to upgrade the chosen system, more time will be required to design the additional interfaces discussed above and to install and activate the system at the additional sites. This site activation process can be lengthy because sites are often brought up serially to minimize the number of trainers needed.

Option One would result in earlier compliance and eliminate six legacy systems in the near term, namely:

- Army – three arsenal systems
- Navy – Marine Corps Industrial Fund (MCIF) system, Naval Shipyard Management System (SYMIS), and Naval Ordnance Management Information System (NOMIS).

Option Two would eliminate at most two more systems, delay compliance, and require additional up-front investment in interfaces and deployments. Given the very real uncertainty that faces the DoD depot system, delaying benefits and increasing near-term investment costs for small and uncertain savings in future O&S costs may not be a prudent course.

CONCLUSION

Our analysis strongly suggested that implementing Option Two would not be advisable. This analysis was accepted by DFAS and the DBOF Corporate Board. No further consideration was given to Option Two in our study.

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APPENDIX A

Economic Analysis of the Depot Maintenance Accounting Systems Oversight Group

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13. ABSTRACT ***(Maximum 200 words)***

An economic analysis examines accounting systems used in the Depot Maintenance Business Area (DMBA) of the Defense Business Operations Fund (DBOF). Two options were considered: to increase the capability of accounting systems in the DMBA and decrease their number. Option One is a separate system for each of the three Military Departments; Option Two is a single system for all DoD DMBA activities. The Under Secretary of Defense, Comptroller directed that an economic analysis be performed so that the DBOF Corporate Board would have the cost information needed to make an informed decision on the preferable option. Option One is found to be preferable to Option Two at this time because the second option was predicated on a single set of production systems that has not come about. Consequently, multiple interfaces would have to be developed for any accounting system chosen as the single system. That interface problem, combined with unique business practices and additional deployments, increase the investment costs of Option Two relative to Option One. Potential operating and support cost savings are very limited. Costs for Option One are provided. Issues are raised about deploying the Navy standard system to the shipyards and the Air Force standard system to the Air Logistics Centers.

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